American Machinist

A McGraw-Hill Publication . . . Established 1877

New York, May 8, 1930

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"THE constant chord method of gear tooth measurement described by Mr. Chapman is so simple and obvious that it should have been evident long ago. However, the obvious is often the last to be seen.

"It represents a new practice which is simpler, and thus much better, than any present practice of chordal measurement; it should be used to supersede all present methods. Mr. Chapman should be commended for this simplification of the chordal measurement of gear teeth."

Earl Buckingham,
Massachusetts Institute of Technology.

Constant Chord Gaging

By W. A. J. Chapman
Wednesbury, England

THE ATTAINMENT of a satisfactory method of gear tooth gaging has ever been elusive. The irregular curve of a tooth profile has complicated the use of ordinary shop measuring devices.

To determine tooth thickness, it is common practice to caliper the length of an imaginary chord perpendicular to the center line. Since this thickness varies from base to top, the chord must be given an arbitrary position between the two. What could be more logical than to select this position at the pitch circle? Always wishing to be logical, we have accordingly adopted as standard practice a chordal measurement of gear teeth at the pitch line. We compute the distance from the top of the tooth to the intersection of the pitch circle with the tooth face. With a gear tooth vernier caliper, we gage the thickness at this point and compare it with the theoretical length of the chord. But is this the true tooth thickness? Are we entirely logical? Let us see.

Here is the method now in popular use. Fig. 1 shows the pitch circle chord where:

A = addendum or depth of tooth at the pitch line
h = depth of tooth at the intersection of the pitch

circle and chord

θ = the angle subtended at the gear cutter by one-half a tooth

N = number of teeth in the gear

D = pitch diameter.

Then the familiar formulas for a gear with a standard addendum are:

$$\theta = \frac{90^\circ}{N}$$

$$l = D \sin \frac{90^\circ}{N}$$

and $$h = A + \frac{D}{2}\left(1 - \cos \frac{90^\circ}{N}\right)$$

But both l and h vary with N, the number of teeth. This gives a tooth thickness for a given gear which differs from that of its mating pinion. In fact, even where pitches and pressure angles are identical, every member of the gear family has a different tooth thickness according to the number of teeth. Somehow our logic seems to have gone awry. Is the fault with the gears or with our method of measurement? Let us make a fresh start.

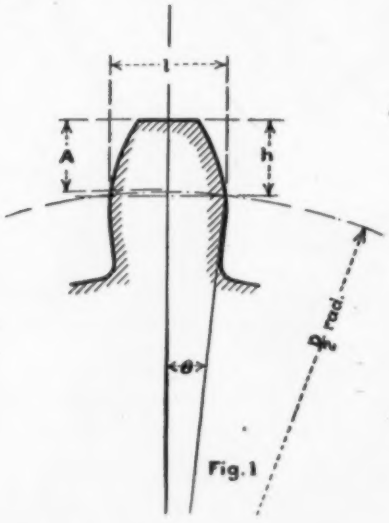


Fig. 1

Fig. 2 shows an involute gear in mesh with a rack. Contact occurs along the lines PE and PF which are normal to the rack tooth faces. EF is a chord between the points of contact, E and F, when the tooth is symmetrically placed with regard to the line PO (O being the center of the gear).

Now let:

w = EF

A = the addendum

d = depth from top of tooth to the chord EF

α = the vertical distance between the tangent to the pitch circle and EF

ψ = the pressure angle

C = the circular pitch

S = the diametral pitch

M = module.

G and H are intersections of the rack teeth with the pitch line of the rack.

$$w = 2\,EP \cos \psi$$

$$EP = GP \cos \psi$$

$$w = 2\,GP \cos \psi \cos \psi.$$

But: $$GP = \frac{C}{4} = \frac{\pi}{4S}\left(\text{since } C = \frac{\pi}{S}\right)$$

Substituting this value for GP:

$$w = \frac{2\pi}{4S} \cos \psi \cos \psi$$

$$= \frac{\pi}{2S} \cos^2 \psi$$

$$= \frac{M\pi}{2} \cos^2 \psi.$$

Thus we have derived an equation for the length of the chord. Now to determine a value for d, the depth of the chord from the top of the tooth

$$d = A - \alpha.$$

But since for a gear with a standard addendum,

$$A = \frac{1}{S}$$

and $$\alpha = EP \sin \psi$$

$$d = \frac{1}{S} - EP \sin \psi$$

$$= \frac{1}{S} - GP \cos \psi \sin \psi.$$

Substituting for GP as before:

$$d = \frac{1}{S} - \frac{\pi}{4S} (\cos \psi \sin \psi)$$

$$= \frac{1}{S}\left(1 - \frac{\pi}{4} \cos \psi \sin \psi\right)$$

Then since, $\sin 2\psi = 2 \cos \psi \sin \psi$:

$$d = \frac{1}{S}\left(1 - \frac{\pi}{8} \sin 2\psi\right)$$

$$= M\left(1 - \frac{\pi}{8} \sin 2\psi\right)$$

Now let us look at these equations. w and d are expressed in terms of the pressure angle and module; they are entirely independent of the number of teeth in the gear. Thus an entire family of gears conforms to a common measurement of tooth thickness. It is true that this dimension is not obtained at the pitch line, but is there any reason why it should be? Gages made for any given combination of pressure angle and module may be used for all gears in that group. In short we have established a common denominator for gear tooth thickness. This is more logical than the old method.

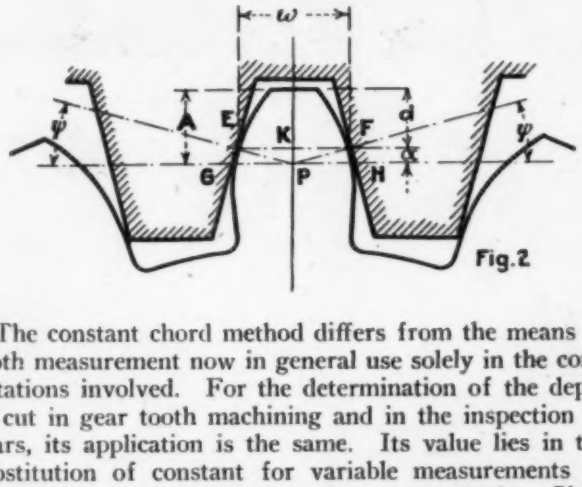
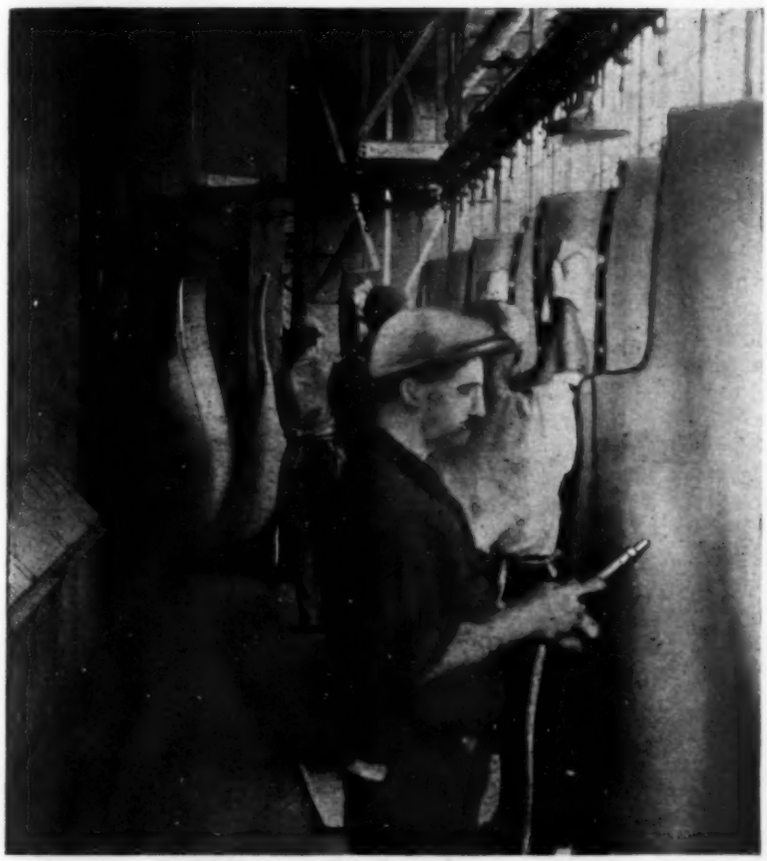


Fig. 2

The constant chord method differs from the means of tooth measurement now in general use solely in the computations involved. For the determination of the depth of cut in gear tooth machining and in the inspection of gears, its application is the same. Its value lies in the substitution of constant for variable measurements of gears with the same pitch and pressure angle. Since pitch and pressure angle are uniform in a set or train of gears, whereas the tooth number usually differs, the measurements are greatly simplified by the possibility of using constant dimensions for chordal length and depth.

Bonderizing and Enameling

As Practiced by Chrysler



After Bonderizing and rinsing, the parts pass through a gas-fired drying oven. They are then wiped and blown off on the line, tack-ragged, and transferred to a bar conveyor which carries them through the enameling tanks and baking ovens

By HERBERT CHASE
Associate Editor, American Machinist

ALTHOUGH metal finishes, especially lacquers and baking enamels, have been improved greatly in recent years, it is a well recognized fact that they do not afford perfect protection against corrosion, particularly when exposed to abrasive action or to abnormally corrosive conditions, or to both.

Precisely these conditions are met in an aggravated form by many parts of automotive vehicles. Fenders, splash aprons, and similar sheet-metal parts tend to become rusted, especially upon their under surface, no matter how great care is used in selecting and applying the enamel. This is partly because accumulations of mud and grit, thrown from wheels or splashed from the road, produce abrasive action. Moreover, actual mechanical scraping or scratching is likely to occur frequently. Again, in seacoast areas, in tropical regions, and during trans-oceanic shipment, salty or other corrosive conditions cause any exposed steel to rust. Finally, the practice of using salt on highways to accelerate the melting of snow and ice results also in salt deposits on various automobile parts which soon show signs of rusting.

Once started, rust creeps under the enameled surface, causing the enamel to chip or peel, and extending the corroded areas accordingly. Salt spray tests show that, even without abrasive action, carefully enameled parts become badly corroded and the enamel loosened over large areas in as little as 72 hours of exposure to the salt spray. Means for preventing or minimizing this corrosive action therefore have become matters of importance, especially to automotive manufacturers, but also, although in a lesser degree, to makers of metal furniture, bath, kitchen, hospital, and laboratory fixtures, shelving, lockers and many other commodities.

To meet this situation, Chrysler engineers naturally gave consideration to various rust-proofing processes, and especially to the process termed Parkerizing which it then used and still is using on several parts of the car, but chiefly for parts other than those formed from sheet metal. While Parkerizing, which is a chemical process that converts the surface of the steel into insoluble phosphates, is effective as a rust inhibitor, the process requires from 40 to 90 minutes for completion. Thus, in the case of bulky parts, such as fenders, Parkerizing would require a large and expensive layout for economical production at a rate as great as that prevailing in a plant making up to 1,500 complete cars a day.

It was found, however, that a comparatively new process, termed Bonderizing, could be used to advantage. This process, developed by the Parker Rust-Proof Company, is similar in some respects to Parkerizing in that it produces a phosphate coating, but it employs an accelerating agent which reduces to one-fifth or less the time required for treatment. A Bonderite coating is produced in seven to ten minutes.

Bonderizing is not a substitute for Parkerizing and is not claimed to be a rust-proof finish, except when used as a primer for paint, enamel, or lacquer. Neither is

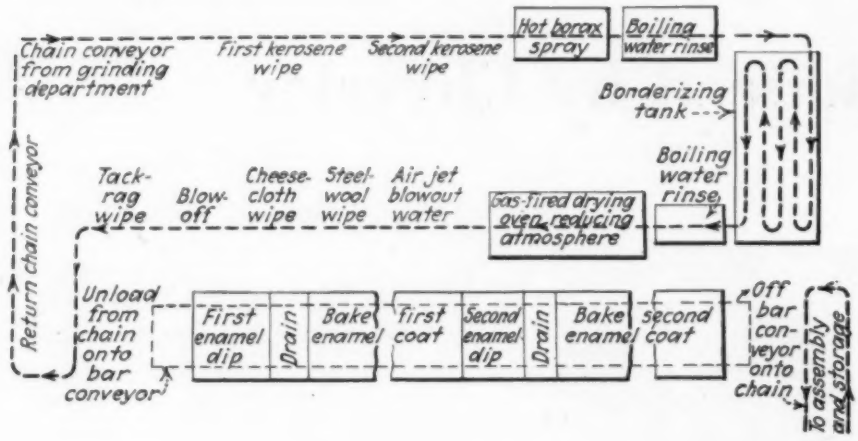


Diagram illustrating the sequence of operations followed in cleaning, Bonderizing, and enameling parts in one of the Chrysler plants

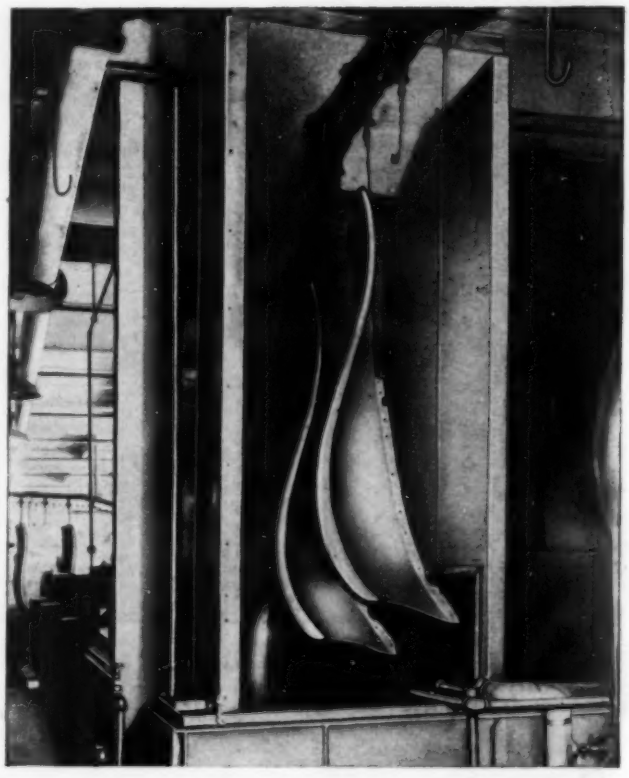
After preliminary cleaning to remove grease and rust, fenders and other parts continue on the chain conveyor into the Bonderizing tank

the procedure followed by Chrysler in using the process typical of its use in all kinds of production. Its primary advantage, aside from the speed with which it is applied, lies in the fact that the coating is not only a part of the metal but has a slightly absorbent surface of somewhat the same texture as an etched surface. This results in forming an exceptionally good bond between metal and enamel. If the latter becomes abraded in spots, the Bonderite coating still exerts a protective effect. In particular, even though mechanical scratching and abrasion penetrate the Bonderite coat, exposing the bare metal to corrosion, the corroded area does not spread under nor loosen the adjacent enamel. Bonderizing takes the place of a metal primer, but, unlike most primers, it becomes a part of, rather than a merely adhesive coating for, a steel surface. In addition, the bond it forms with the enamel is said to be more in the nature of cohesion than adhesion, because of the nature of the surface afforded.

IN THE Bonderizing process the articles to be coated are immersed in a solution made by dissolving Bonderite powder in tap water and heating the solution to a temperature of 210 deg. F. In the Chrysler installations the parts are hung upon chain conveyors so arranged and traveling at such a rate that the parts, though continually moving, remain in the 54,000-gal. tank 7½ to 8 min. It is necessary, however, that the surfaces to be treated be chemically clean before entering the Bonderizing tank. The entire process, including cleaning and enameling, as conducted in the Chrysler plant, follows the cycle indicated in the schematic diagram here reproduced.

Fenders, splash aprons, and other parts to be treated pass from the press room, where the stampings are made, into a grinding department where any rough or uneven spots are ground smooth, and the parts hung upon a chain conveyor which carries them in a continuous stream through the cleaning and Bonderizing processes. At the first and second stations each piece is wiped with cloths wet with kerosene to loosen and remove some of the grease and the lubricant applied during stamping operations.

Further and final cleaning is effected as the parts pass through two spray-washing inclosures. In the first of



these a boiling solution, containing 6 oz. of borax per gal. of water is sprayed upon the parts from jets, issuing at a pressure of 10 lb. per sq.in. maximum. From the first wash the parts pass immediately into a second booth where the borax solution is washed off with a jet of clean boiling water. The time in each wash is approximately one minute.

Next, and while the parts still are hot, the chain conveyor dips and lowers them into the hot Bonderizing solution, carrying them the length of the tank five times, or a total of 225 ft., the chain moving at approximately 20 ft. per min. From this tank the stampings pass first through another boiling water spray to rinse them of the Bonderite solution and then enter a gas-fired drying oven in which a reducing atmosphere at a temperature of 275 deg. F. is maintained.

As the parts leave this oven any water remaining in

seams is blown out with compressed air. All workmen who touch parts after the latter leave the drying oven wear gloves, both for their own protection (as the parts are hot) and to prevent spotting from grease or perspiration.

Any loose particles or "dust" from the Bonderizing must be wiped off to assure a perfect enameling job. This is accomplished, first, by hand-wiping with fine steel wool, second, by a similar wipe with a clean cheese cloth, and blow off, and finally, by wiping with a tack rag to remove any lint upon the surface.

The Bonderized parts thus cleaned and dusted are now ready for enameling. This process is carried out in practically the same manner as if the parts had not been Bonderized. Since a bar conveyor moving at slower speed than the chain conveyor is needed in the enameling process, however, the parts are shifted from the chain conveyor to the bar conveyor. They then dip into the enameling tank, pass over a drain trough and into a drying oven where they are baked for 2¼ hours, the temperature being raised gradually until it reaches a maximum of 410 deg. F. At the end of this oven a second dip is given and a second bake for a like period. In this case the maximum temperature is 415 deg. F. The two ovens are of the Young Brothers make, are oil-fired, and have automatic thermostat control.

As the parts issue from the oven and become cool enough for handling, they are hung upon another chain conveyor and delivered by it to assembly or temporary storage departments.

Many stampings thus Bonderized and enameled have been subjected to salt spray tests for several weeks without showing corrosion or peeling of the enamel. An average of about 135 sq.ft. of surface per Chrysler car are now Bonderized. The parts treated include fenders, fender guards, splash aprons, dust shields, gasoline tank covers, trunk racks, hood sills, license plate and tail light brackets, headlight tie-rods, and several other external members.

Aiding the Manufacturer to Make Repairs

By W. F. Schaphorst

Consulting Mechanical Engineer

AN EXCELLENT plan when ordering repair parts is to make a rough sketch of the machine, or portion of the machine to be repaired or replaced. It is a simple matter to make a sketch sufficiently distinct for the manufacturer to tell what part is wanted. In case there is any doubt of the exact piece wanted, an arrow on the sketch will clear it up.

Further, if there is a number on the machine, it should be given. The words right, left, front, or rear should not be used where there is any chance for misinterpretation. Merely to inform the manufacturer that "the cast-iron gear on the north side of the machine we bought from you is broken," is not sufficient. These adjurations may seem unnecessary and out of place in practical work, but it is surprising how often manufacturers receive "explanations" just as vague as this. The more information given the manufacturer, the more promptly a repair can be made.

Support for Machine Tool Research
Discussion

By Ernest F. DuBrul

General Manager, National Machine Tool Builders' Association

"AMERICAN MACHINIST," on page 462, Vol. 72, published an article by John Edwards, discussing support of machine tool research. After commenting on college laboratories receiving steam engines and other power equipment for purposes of research at shop cost or even as outright gifts, the author says: "Not so with machine tools! The director of one of America's finest engineering laboratories, after contacting with the leading machine tool manufacturers, found not one who would offer the slightest concession on machines for research purposes. Naturally, tool research will lag with this university and others until manufacturers take a more far-sighted view of the situation."

Now for the other side of the subject. Why should the machine tool industry give the educational institutions either concessions or out-right gifts of machine tools for research at the professor's own sweet will, without co-ordination with other projects that may be of real value? Why should anyone give equipment, or funds, on a blind faith that it might turn out to be of value?

The machine tool industry is doing a tremendous amount of research inside its own walls, and it is not at all as backward as this writer seems to think. But if this is not enough, it would seem to be up to some other business class to do more. It isn't the machine tool industry that gets the biggest benefit from machine tool improvements; users of machine tools get that. The machine tool builders at best have gotten only quite modest profits. Should they stand all the cost of their own research, and besides furnish machines to school men for research that may have no practical bearing and no appeal to the machine tool builder?

The machine tool builder makes one small profit on his machine when he sells it to a user. This profit averaged, for a group of good and efficient producers over the ten post-war years, less than 7 per cent on the total investment in their business. But large machine tool users very often make 200 or 300 per cent a year on their machine tool investments. Executives of large machine tool using companies say they will not buy a machine tool unless it pays for itself in a year. They want a paltry 100 per cent a year dividend on the machine tool builder's brain, plus the investment that the user put in at the price.

If there is any very keen demand for research by professors in research institutions, let the users put up the cost of furnishing the equipment and at the regular price. So far, the builders have financed all the research that they felt able to undertake. They are not ignorant of what sound research may accomplish. But they lack confidence in some kinds of research the researchers can accomplish. There are some pretty cold facts in this question of machine tool research and who ought to pay for it. Some executives of industries that use machine tools should be approached by the engineering laboratories and the case for research proved to them.

EXECUTIVE · FORUM

Is Incentive Necessary?

"SHALL it be the usual stake?" Robert L. Austin, president of the Norwalk Loom Works, turned to Bill Holland on the first tee of the Fairway Country Club. During the summer months he frequently played golf with Holland and found these friendly tilts illuminating as well as enjoyable. Often while trudging from tee to green, their talk would drift to industrial topics of which Holland was a keen student. Many of his casual observations Austin found to be of real value in managing the affairs of his plant.

"Well, I haven't quite hit my stride yet, but I'm willing to gamble you're as badly off," assented Bill.

There was not much to choose between the two drives and as they started down the fairway Holland asked, "Did anything important come up at the directors' meeting last night? I could not get there."

"Most of the discussion was about our declining earnings," Austin replied. "With increased competition, there seems to be little hope of higher selling prices. Our one salvation lies in reducing production costs. I've made up my mind to leave no stone unturned to reverse the present trend of profits."

"Did you ever consider adopting a wage incentive system?" asked Bill. "A report made by the National Metal Trades Association shows 54 per cent of its members using some form of premium plan. There is unquestionably a tendency toward more extensive use of these methods. This must indicate favorable results."

"I imagine most executives have given some thought to the subject," responded Austin. "No doubt such systems are of value in certain types of manufacture. On the other hand, I can see in them many objections, particularly with regard to our loom works. In general our men are experienced and industrious. They have worked for years on a fixed hourly rate and produce a fair day's work. I have a suspicion that these bonus schemes are often an attempted substitute for effective management."

"But at present you have no standard of performance—no measure of your workers' output," Holland objected. "You insist on an accurate gage of other plant functions. How do you know your present production is efficient?"

"Simply by comparison with previous costs," Austin asserted. "For example we know that our men are turning out more than they did ten years ago. That shows we are not slowing up."

"They should turn out more—a good deal more, in view of improved equipment and advances in shop practice," commented Bill.

"Any premium plan costs money—not only for the increased wage payments but for administration expense," Austin pointed out. "Rates not carefully set do more harm than good. High rates are protected by a safe pace, and the workman gets a bonus he does not earn. If an attempt is made to correct the error, the entire system is discredited. Low rates arouse no interest. No—I do not believe an incentive system is essential by any means."

"Look at that putt!" exclaimed Holland drily. "You'd never have sunk that without a bet on the hole. You need an incentive whether your employees do or not.

What Do You Think About This Executive Problem?

Figures are not lacking to demonstrate that many concerns believe wage incentive systems to be profitable. Not as much prominence is given the weaknesses and failures of such plans. When is it better to install a premium plan, and when is it better to adhere to the fixed hourly rate?

What conclusions have you reached as to wage payment plans and their limitations? *American Machinist* invites an expression of your views which will be of interest to other readers.

DISCUSSION

OF PREVIOUS PROBLEMS

Sales or Sincerity?

It is axiomatic that sincerity is the keystone of all permanent sales success. Unless a manufacturer wants to put his whole effort into one or a series of fast, big scoops and promptly retire to the sidelines, he'd better not view sincerity merely as one of the sweet and simple virtues. It might look like hard lines sometimes to give up an order when a single, simple promise might definitely land it, but we all know the old story about the house built upon the sands.

Sales policy should be looked upon as a definite ingredient of any product. A flaw in sales policy is in many cases more disastrous than a flaw in the product itself. A flaw in construction, in metal, or even in design, is a local sort of thing, subject to remedial measures, and affecting only one or a few units of production, but it may often be remedied by a little retouching here or a simple rejection there. Maintaining good will is not a simple matter of recasting metal.

Paradoxical as it may seem to some world's champion promisers, it's not every purchasing agent who will make a rush for his fountain pen the minute some salesman promises him the buttons off his underwear in the way of delivery. We all, being human, are prone to look gift horses in the mouth. Let some dealer offer us $125.00 more on the old car than we had any right to expect and watch us—that is if we're wise—start some first class scrutinizing of the shiny new outfit our dealer friend is trying to "give away." The same thing applies to rash promises in any field. Every good purchasing agent knows just about what sort of deliveries to expect. Often his experience is greater than that of the too enthusiastic salesman who would promise first and investigate afterward.

By and large, promises are nothing to tinker with in business. We've all had promises made to us—and broken—with resulting loss of business to the seller who insisted upon insulting our intelligence by thinking he could get away with it. Some of us also have had the grim pleasure of having an order refused because the delivery date frankly could not be met. Which of these fellows is the most popular around the place when we want to buy something?

—WILL ARMOUR.

What Price Titles?

Do high sounding titles take the place of high salaries? No, not with self-thinking, competent men. I have found that the men who revel in high sounding titles are generally arrogant, weak-kneed incompetents, whose ego runs away with them. I would not knowingly employ a man who would rather have a title than an increase.

As to the justification of this practice, I say that the employer who practices this system is simply undermining his whole organization. Give me good competent men who don't care what their job is called, but who produce results, and it will be the easiest thing in the world to build up a strong and efficient organization.

—CHARLES R. WHITEHOUSE, *Chief-Time Study, Holtzer Cabot Electric Company.*

Should Special Work Be Segregated?

On two different occasions I have solved the problem to the satisfaction of the customers, management, and workmen by taking each processing foreman and going over his department with him, setting aside certain workmen (invariably of the higher class), and certain machines to run on specials and small lots only. When the specials and small lots were cleaned up, these workmen or machines were put on regular main line production. This meant that we were hardly ever held up on main line production or on special deliveries.

With this method it is practically impossible to make rash or false promises on either specials or main line deliveries, as the comparative times on special and main line products can be closely worked out. The production clerk in charge of this special work can, of course, frequently get a run of his few pieces on a main line machine, especially when a similar part is being machined for production.

The flexibility of the scheme has brought greater co-operation from the foremen and workmen in getting specials through on promised time. Whether this is applied to the manufacture of small tools, assembled machines, or textile yarns, it works so smoothly that it pays for the study needed to balance the machines allotted to main line production and to special work. The increase in monthly production will run from five to ten per cent with no extra effort by the management.

—E. E. GAGNON.

Who Should Do the Estimating?

As in the case of efficient draughtsmen, good estimators cannot be made from men who have had a minimum of experience in the shops. Young men in charge of the estimating department constitute an anomaly, and their estimating in my opinion is a case of "chance it." Their "amounts," except in the case of the simplest class of material, are generally far too high and lose the job, or far too low and mean loss for the employers. What else can we expect when an estimate is given by men without an abundance of shop experience, especially when the estimate involves difficult processes, intricate details, and the human element as regards piece work? Therefore the man whom the writer would pin his faith to as official estimator is one who has spent a long time in the shops, not in one shop all his life, but in many shops and under different regimes. The shop foreman concerned should be

consulted, but let it not be expected that his help will be dependable after merely seeing a blueprint in the official estimator's hands for a few minutes. He must have time, say a night or two (good foremen never object to using an evening or two to help such things along) to examine all particulars.

The estimating official, such as I have proposed, should be a super-mechanic of all-round experience, who has specialized in one class of the trade, say as a fitter, and is well equipped with text-book information. Having for many years worked under the scheme here proposed, the writer has no hesitation in recommending it.

—J. T. TOWLSON,
London, England.

Who Should Control Routing?

Clearly defining all lines of authority is an absolutely essential policy to follow. It is not enough that the line of demarcation be sharp and distinct—the relationship between responsibility and authority must be rigidly maintained as well, or storm and strife will be the lot of the personnel involved. The organizers of the Masfield Foundry & Machine Company have disregarded this principle in giving Bowman the responsibility of making prompt deliveries while giving McMurray the authority to secure action on the schedules established by Bowman. The reports McMurray gets are probably filed away in the waste basket or in a pigeon-hole after little if any consideration. Since it is not his responsibility that work is behind, he has slight interest in exercising his authority and seeing that operations are performed in accordance with the established schedule.

The last principle of good organization was mentioned by Bowman, namely, functionalization. No one individual should have too many varied duties. In this age of specialization and increasing magnitude of manufacturing operations, it is necessary that functions be divided between individuals who are particularly fitted to carry on the work in their own departments in co-operation with all the other functional foremen. Only in this way can the maximum efficiency of the entire organization be secured and maintained.

—W. B. LINCOLN, JR., *Chief Engineer,*
W. J. Savage Company.

Should Price or Payroll Be Cut?

To build up an organization of skilled workmen requires the expenditure of considerable time and money. To acquire one which is also loyal takes considerably more; and the concern that has such an organization should be willing to take some loss to retain it. If this loss is not taken in dull times, it is sure to be taken later when orders are abundant and money must be spent to obtain and train employees. If a concern is unwilling to do its part in protecting its employees against unemployment, all it can expect in return is a large labor turnover and nothing in the way of loyalty.

An example of how not to proceed is being given right now by a large corporation which should have known better. About a year ago this corporation purchased a plant located in a small town and added this industry to its large chain. The demand for the product is seasonable, and during the winter months sales drop to almost nothing; but the former owners had always operated at a fairly uniform rate and had stored the excess production during the winter months. The employees all lived in the town, and due to the steadiness of employment and favorable living conditions, accepted lower rates of pay than prevailed generally in the industry. Conditions were almost ideal and the old owners had grown rich. All the new owners seemed to be able to see was no demand for the product during the winter and consequently closed the plant last November.

Now the prospect of an early spring is producing sales; orders were sent out from headquarters to start up the plant, but difficulties were immediately encountered. The key men have left the town and have secured employment elsewhere. The employees who are available demand the rates of pay which are usual in the industry.

—C. J. MORRISON, *Consulting Engineer,*
Meyer, Morrison & Company.

How Long Should Records Be Preserved?

In considering this problem, attention is invited to the usefulness of old records in the prosecution of patent applications before the Patent Office and particularly where an application is involved in an interference proceeding. In such cases it becomes necessary to prove:

1. When the invention was conceived.
2. When sketches or drawings were first made.
3. When the first written description was made.
4. When the invention was first explained to others.
5. When the invention was first embodied in a full size device.
6. When it was successfully operated.

These dates not only must be accurately arrived at, but sufficient proof in the way of records must be produced to establish the same. The presence or absence of old records in this connection may be the deciding factor in an important patent case. While such a case may never arise, if it should, the cost of having preserved the records for a few years back would not compare to the cost of losing out on a seventeen-year monopoly.

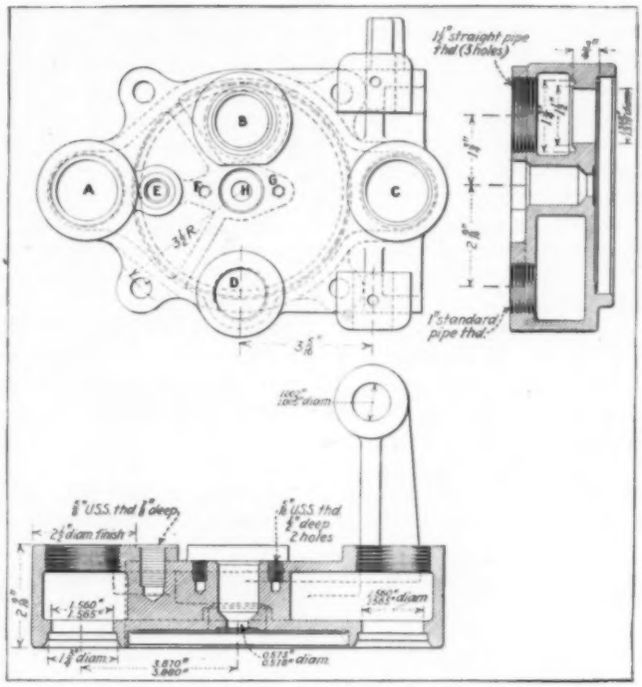
Often the record of a business transaction can be thinned out to reduce bulk, and only those papers of evident importance preserved.

—W. H. KNIGHT,
Ingersoll Milling Machine Company.

Keeping Step in Drilling

Synchronized operations on a gasoline pump cylinder head afford an excellent example of multi-station planning

SEVERAL interesting points are included in the following method of drilling and tapping gasoline pump cylinder heads. The work cycles of four machines have been so planned that they may be operated by one man. In order to utilize the operator's time to best advantage and synchronize the machine processes, it was found necessary to develop an automatic means of handling fixtures. The resulting set-up used by the Gilbert and Barker Manufacturing Company of Springfield, Mass., meets these conditions in a novel manner.



This gasoline pump cylinder head is machined according to the illustration. Operations not described are performed separately

The four work stations are supplied with material by a continuous roller conveyor. The gray iron castings, of which the cylinder head is made, are supported on fixtures, upon which they are located from both a circular recess on the under side and drilled holes which have been previously machined. No clamps are required as the operations all produce a vertical downward pressure, which with the positioning surfaces of the fixture, holds the casting in place. Five fixtures are used, one for each of the four work stations plus one to receive the next piece to be machined.

The work is placed on the fixture at station No. 1 and is moved by hand through the work stations after each series of operations has been completed. When the machining at station No. 4 has been finished, the operator removes the casting and slides the fixture from the roller conveyor to a roller platform. He then presses a foot pedal which causes the fixture to be returned to station No. 1 and cleaned for the next piece.

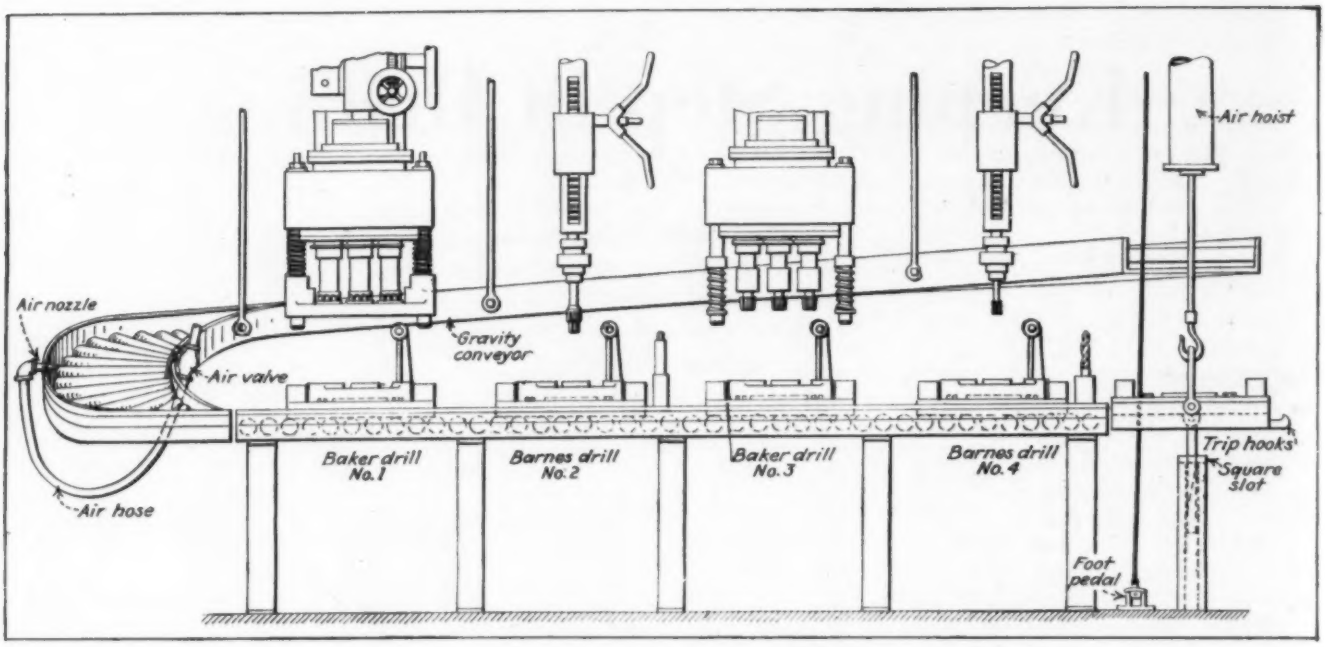
This time-saving device consists, in part, of an air hoist which elevates the roller platform upon operation of the foot pedal. Hinged to the under side of the platform, is a square bar of cold rolled steel, which passes through a square slot. As the platform and fixture are lifted, this bar slides vertically through the slot which acts as a guide. A quarter twist in the bar produces a quarter turn in the roller platform.

About three feet above the normal position of the platform, the end of a roller gravity conveyor is located. When the fixture platform is elevated, trip hooks on its side engage a steel rod at the lower edge of the conveyor. As the pull of the air hoist continues, the platform is tilted, discharging the fixture onto the conveyor. The air valve is then automatically released allowing the platform to return to its lower position.

The fixture slides down the conveyor behind the machines by means of gravity. A U-curve in the conveyor brings the fixture to the front again in place for its next cycle at station No. 1. As the fixture rounds this curve, it strikes a projecting lever which operates an air valve. Immediately, the fixture is thoroughly cleaned from chips and dust by a blast of air, which is released from a nozzle secured to the side of the conveyor. The operator, thus freed from handling the fixture, is enabled to devote his entire time to the machining operations. Were it not for this arrangement, the time cycle of the machining operations would be interrupted, synchronization would not be possible, and another operator would be required.

STATION No. 1 comprises a Baker drill press equipped with a permanently located reaming jig and a four-spindle head. This jig is provided with two plugs which fit recesses in the work fixture thus locating the casting in relation to the spindles. Referring to the illustration of the cylinder head, holes *A*, *B*, *C*, and *D* are machined at this station. Special tools are used which bore holes *A*, *B*, and *C* to 1¾ in., counterface them, and slightly countersink them to permit easy entry of the taps. Hole *D* is simultaneously bored to 1¾ in.

While this cut is being taken the operator moves to station No. 2, a single spindle Barnes drill press equipped



Roller conveyors are used to connect the four work stations and return the fixture to station No. 1 on completion of the machining operations

with a Magic chuck. Two separate tools are used on this machine. The first bores the lower section of hole *B* to $1\frac{5}{16}$ in. and counterbores it to $1\frac{3}{4}$ in. While this tool is being fed by the machine, the operation at station No. 3 is started. The operator later returns to station No. 2, where the feed has been tripped automatically at the proper depth, and changes the tool in the Magic chuck. The feed is again engaged to ream the same hole to $1\frac{3}{8}$ in. and form the valve seat at the upper face, using a special combination tool.

The fixture is located at station No. 3 by plugs which fit recesses in it as at station No. 1. The machine tool here is another Baker drill also provided with a four-spindle head and a tapping attachment. Holes *A*, *B*, *C* and *D* are tapped, the first three with a $1\frac{1}{2}$ in. standard pipe thread and the last with a 1 in. standard pipe thread.

At station 4, a single spindle drill press is used with another quick-operating chuck. Hole *E* is first drilled to $\frac{1}{2}$ in. and counterfaced with the same tool. It is then tapped with a $\frac{5}{8}$ in. U.S.S. thread $\frac{7}{8}$ in. deep. Holes *F* and *G* are first drilled to $\frac{1}{2}$ in. and then tapped with a $\frac{5}{16}$-in. U.S.S. thread. Hole *H* is reamed to 1 in. and countersunk as illustrated.

This completes 24 machining operations which are performed by a combination of special tooling, multiple-spindle, and multiple-machine operation. It is obvious that the success of any such set-up lies in carefully planning and correctly timing the sequence of operations.

Aluminum for Threaded Parts

By J. D. Porter
Aluminum Company of America

THE use of aluminum for engine parts and airplane apparatus presents an increasing number of instances in which threaded aluminum parts are engaged. This was brought out in John F. Hardecker's article on page 629, Vol. 71, of the *American Machinist*. The tendency of these parts to seize when threaded together is commonly recognized, and in calling for such threads the designer must guard against this unless the screwed joint is to be permanent. In assembling screwed joints which must be readily taken apart there are several measures which may be taken to lessen or avoid freezing of the threaded surfaces.

Where a certain amount of play is not objectionable, a loose fit between the threaded areas is often sufficient. For tighter fits, where considerable pressure occurs, the friction surfaces are often coated with an "anti-seize" compound in the form of a paste. When the threaded joint is to be periodically taken apart in a shop, this paste may be readily employed at each re-assembly.

A more permanent protection is afforded, however, by an electroplating of zinc on one of the threaded surfaces. This treatment minimizes or entirely eliminates seizing; it has the added advantage that each separation and rejoining of the threaded parts involves no renewal of the coating. If the shop is warned to take these precautions it is entirely practical to use aluminum in both threaded parts.

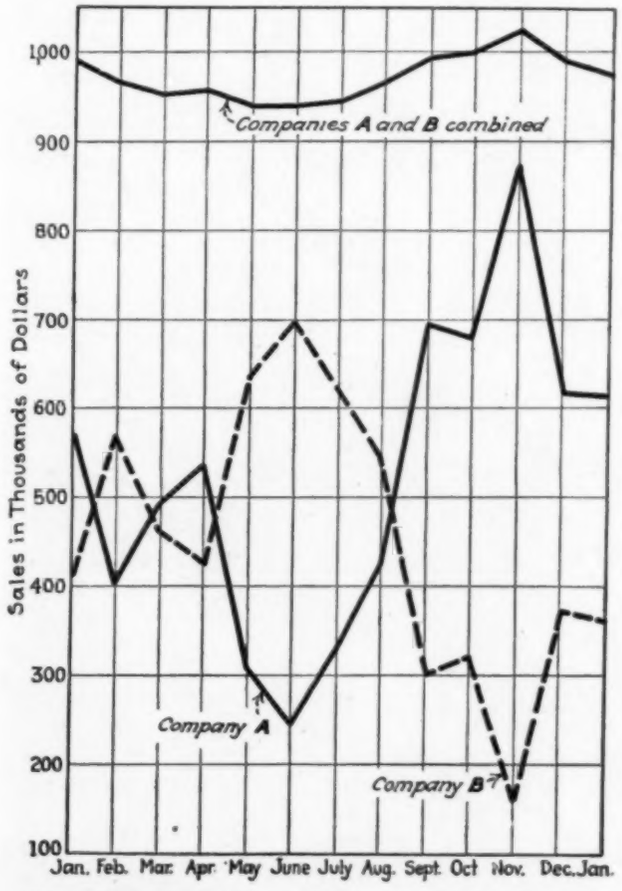
ROUGHING of tungsten-carbide tools should be done with a 60- or 80-grain grinding wheel and finishing should be done with 100- or 120-grain wheel. Diamond-lapping a tool that has been previously finish ground and stoned or honed will increase the life of the cutting edge of the tool approximately four times. For the average class of work, diamond-lapped edges are of no advantage, but in the finishing of non-ferrous metal, bakelite, hard rubber, fiber, babbitt, and bronze, a lapped edge will give a far better finish.

Straightening the Employment Curve

By W. B. Lincoln, Jr.
Chief Engineer, W. B. Savage Company

IT IS unfortunate that our present organization of industry seems unable to cope with the problem of fluctuating labor requirements. There are many products manufacturers whose consumer demand and consequent production are inherently seasonal in their nature. Very few firms have the good fortune to be handling two lines which balance each other, like the coal dealer with his ice business in summer to counteract the slump in the sale of coal. As long as a seasonal condition persists it will be necessary to reduce the working force in times of slack operation.

A prominent industrial leader was once asked what he would do if given the choice of parting with his plant or his working force. He unhesitatingly stated that he could easily duplicate his plant if he still had his old organization, but it would take years to build a new organization in his old plant. Old and skilled employees form a foundation upon which it is easy to rebuild an organization after a lull in operation. Every effort should be made to keep that foundation intact. The writer presents the following method of handling employment which he has found to possess far reaching advantages.



The combined sales curve of companies A and B is comparatively smooth. Co-operation on employment will prove advantageous to the companies and their employees

Company A is a plant manufacturing a standard line of products whose sale was controlled by conditions making it impossible to smooth the curve. The nature of the operations and equipment used made it impractical to take on any other lines of product whose sales peak might coincide with the valleys of the regular line of product. There was one major and one minor annual peak, the rest of the year being sadly slack. A certain majority of the workers had to be experts, and were kept at all costs. Some staple lines were manufactured for stock in anticipation of the busy seasons, but it was impossible to retain all of the less-skilled workers during the slack seasons.

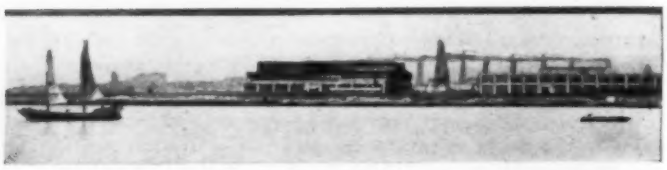
After considerable investigation, another firm was located whose product, though not competitive, passed through somewhat similar operations, and was subject to a variable demand, the peaks coinciding with our valleys. An agreement was made between Company A and Company B, to swap employees. During slack seasons, we sent our surplus labor to the other plant which was then experiencing its rush period. In that way, we had an opportunity to hold our skilled workmen, using them on either their regular work or that normally done by those who were moved to the other plant. When our peak months arrived, the transient labor which had formerly been lost, returned and took up their old duties, requiring practically no instruction or breaking in to get them started. If necessary, some extra people from the other company's force would also move over to our shop for the peak season.

THE benefit was not only a matter of economy in labor, eliminating the necessity of carrying any surplus help on the pay roll and the training of green help, but we had the extra advantage of being able to offer our employees year around employment. We did not have to hire men with the knowledge on the part of both of us that at certain times we would probably lay them off. We secured a stable year around working force, and in spite of the erratic sales curve, reduced the actual turnover to practically nothing. The effect on the morale of the organization scarcely needs mention. The arrangement does not need to be limited to a group of two companies of course.

There is a wonderful opportunity for the Chamber of Commerce of every industrial center to greatly assist industry in lessening the unpleasant features of varying labor requirements. Using the plan outlined, it could act as the clearing house and co-ordinator. A standard report from each industrial concern in the locality, properly recorded, cross-indexed, and correlated with the reports of other plants, would enable industry to offer labor steady year around employment, free from worry and fear of layoffs. In return, there would be an ever-ready supply of skilled, trained, and contented workers available at all times when needed.

Japan Also Builds Electrical Machinery

A modern factory, equipped with machine tools and appliances of late design, is securing excellent results



ELECTRICAL machinery is playing an important part in the industrial development of Japan, and its manufacture is receiving the attention of forward looking men of affairs. In 1911 the Shibaura Engineering Works, which began its existence in 1875 under the name of Tanaka Works, decided to concentrate all its time and energy on the manufacture of electrical machinery. The Mitsui House, known the world over for its varied enterprises, acquired the Tanaka Works in 1893, and in 1910 joined hands with the General Electric Company of America so that the designs and patents of each might be used in both countries. This arrangement was further extended, in 1919, to cover the exclusive right to handle the General Electric Company's products in Japan.

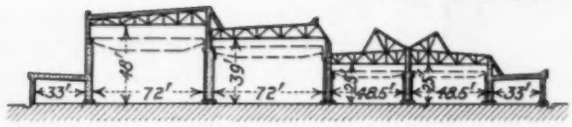
At the time of the earthquake and fire on September 1, 1923, the Tokyo plant of the Shibaura Works, covering 20 acres, was entirely destroyed. In four months, however, it was restored, the new buildings giving 430,000 sq.ft. of area. But the disaster also led to the development of the other plant, known as the Tsurumi Works, which covers an area of 110 acres near Yokohama. This latter plant, as it now appears, is shown in the headpiece. There are however, extensive additions to be made to the plant, some of the foundations for new buildings being already in place.

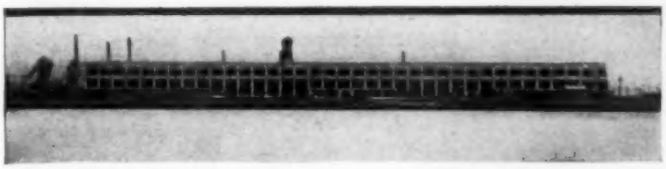
The main building now in use is 308x852 ft. It is of rather unusual construction, as can be seen by the cross section in Fig. 1. Four, bays run the whole length of the shop, and two outside low bays part of the way. One of the main bays is 48 ft., one 39 ft., and two 25 ft. high. In addition to providing heights to accommodate different classes of work, this design also permits the use of windows where the roofs step down from one height to another. A double skylight provides light and air for the double bay at the right. There is also a forge shop with an area of more than 36,000 sq.ft., a pattern shop with nearly 39,000 sq.ft. and a warehouse with almost 76,000 sq.ft. The location is on the water, so that freight shipments are easily handled direct to or from the steamers. The machine equipment is of modern American manufacture for the most part, and is laid out to facilitate the flow of work through the shop. This is not easy, considering that the output includes frequency changers, generators, motors for railway and other purposes, converters and electric locomotives.

The work naturally follows methods used at Schenec-

Fig. 2—Seventy-three-ton electric locomotive built for Fushun Colliery in main bay of shop—taken at night

Fig. 1—Cross section of shop showing the varying heights of the four main bays





By FRED H. COLVIN
Editor, American Machinist

tady and in other plants of the General Electric Company in the States; but it is carried on with Japanese workmen and shop executives. Both are doing excellent work, and the results compare very favorably with the home plants.

The illustrations show not only the work in progress but also the construction of the shop. In Fig. 2, for example, is a 73-ton electric locomotive for the Fushun Colliery being moved over the other machinery in the high bay by a 112-ton Shaw crane. The large window area on the right, the construction of the craneway, the distribution of the electric lamps both over the crane and beneath the craneways, and the consequent even distribution of the light are apparent. The white paint on the steel work helps reflect light into the shop.

In contrast with this is the daylight picture, Fig. 3, at the other end of the same bay. This shows a large boring mill at the left and the stator on which it is working, as well as similar work in the foreground. Beyond, are a large planer and other heavy machines, while on the right of the well defined aisle is the large floor plate with its portable boring machines, drilling machines, slotters, and the like. This view also shows the four light cranes and the large 112-ton crane, near the other end. The span of the bay is 72 ft. Wood block flooring is used.

A closer view of the floor plate and its large portable machines is seen in Fig. 4. Here drilling, boring, milling, and slotting are done on parts too large to be handled efficiently, if at all, on the regular stationary machine tools. Two stator frames for 10,000-kw., a.c. generators and a 6,500-kw. rotor spider, all for Japanese electric power plants, are being worked upon.

The second bay of the shop, 39 ft. high in the clear but of the same 72-ft. width, is shown in Fig. 5. This bay contains the medium sized machines among them a goodly array of radial drilling machines, horizontal boring machines, and medium sized planers. In the foreground are parts of the railway motors, a.c. and d.c. generators, and motors that form part of the output of the plant. Some idea of the extent of the railway motor business may be had by a study of Fig. 6 where 25 such motors for the Seibu railway are being assembled. This also shows the handling facilities for motor frames and parts, the benches used by the assemblers, and the racks on which small parts are stored.

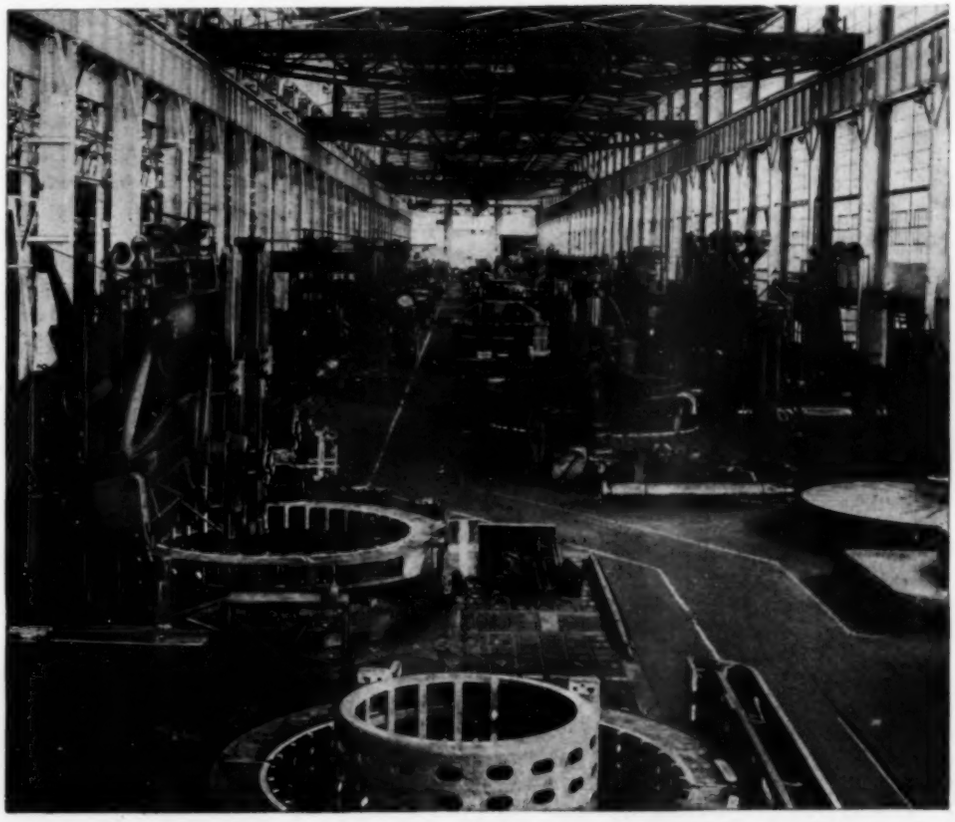


Fig. 3—Daylight view of other end of heavy machine bay with its five cranes of 72 ft. span

ARMATURES for larger motors are seen in Fig. 7, the large armature at the left of the center being for a 3,200-hp. induction motor for the Imperial Government Steel Works at Yawata. The type of stand, or screw jack, used in supporting the armatures, is clearly shown.

A production planing job is shown in Fig. 8. Eight halves for 1,000-kw. rotary converters for government railways are being planed at once on a 10x10x24-ft. Niles planer. On many sizes of work of this kind the frames are now being fabricated from steel plate, cut by oxyacetylene torches to the desired shape, and welded into a solid whole by the arc welding process. The

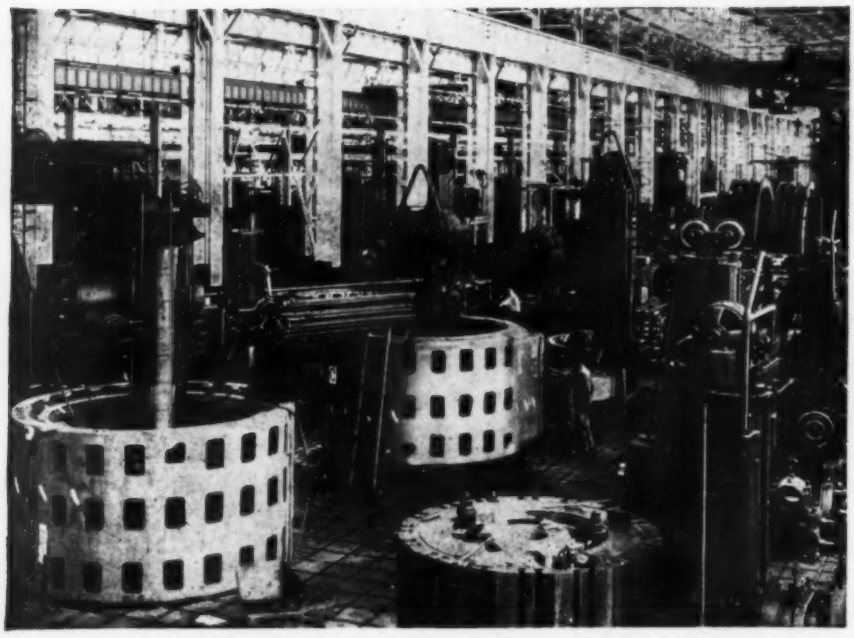


Fig. 4—Floor plate for portable tools in heavy machine bay

Fig. 5—Medium sized tools in second bay. Railway and motor parts on floor

Fig. 6—Assembling railway motors for the Seibu railway

Shibaura Works is following the practice of American shops very closely in this as in many other modern practices.

A good general idea of the size and variety of the work handled in this plant can be had from Fig. 9. Cores and coils of large rotary machines are being assembled. The machines shown vary from the stator for a 3,200-kw. vertical generator for a paper mill, to a 10,000-kw. generator stator for a power plant, with a 6,000-kw. synchronous condenser and a 5,000-kw. a.c. generator for power plants, thrown in.

IN Fig. 10 is a large assembly floor at the end of the large bay. At the left is a 13,500-kva., a.c. generator, and beside it an 8,000-kva., both vertical machines. At the right is a 30,000-kva., synchronous condenser. All three are for Japanese power plants, which are increasing their capacity at a steady rate.

At one end of the large bay is the test floor. Here all machines are put through their paces to insure satisfaction to customers. From this department they go on for final inspection, painting, crating, and shipping, Protection for shipping is a more than ordinarily important matter, because the finished machines, which are shipped to many points in the Far East, are transported principally by water.

Such crating for water transport is almost an art in itself. In one instance, indeed, the packing case is lined with metal having soldered joints. This is not always considered advisable, however, owing to the likelihood of condensation inside the air tight lining.

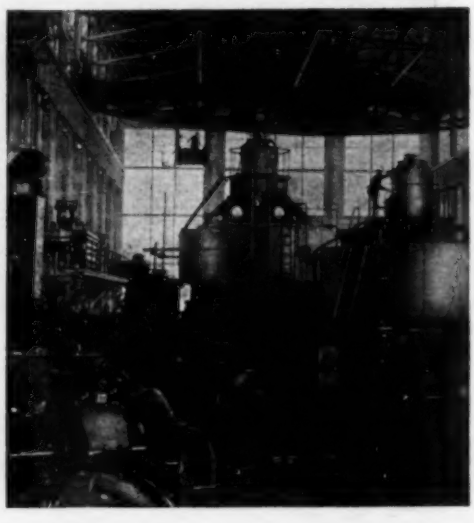


Fig. 7—Winding armatures for fairly large motors, one of 3,200 hp. being shown in center

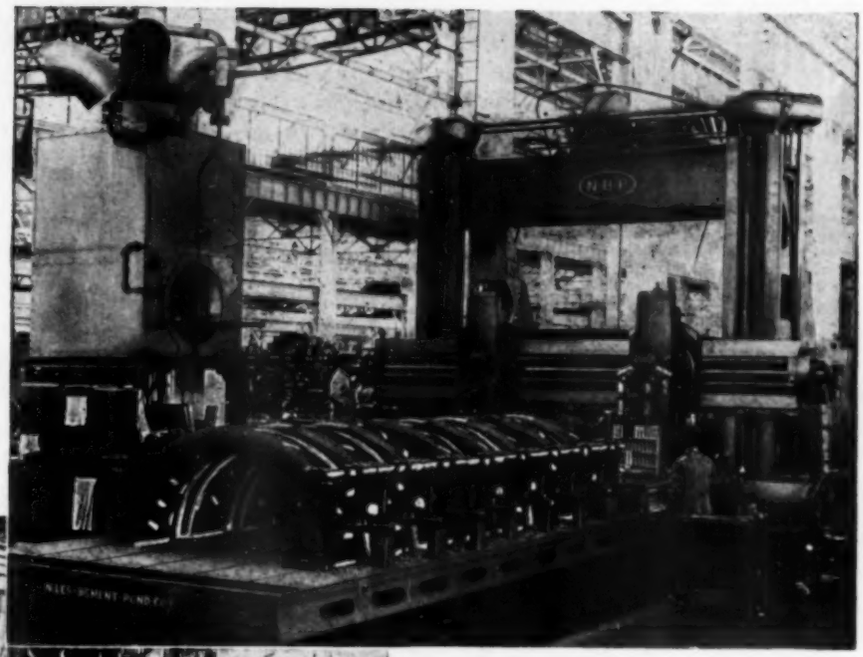


Fig. 8—Planing eight frames for rotary converters on a 10 x 10 x 24-ft. planer

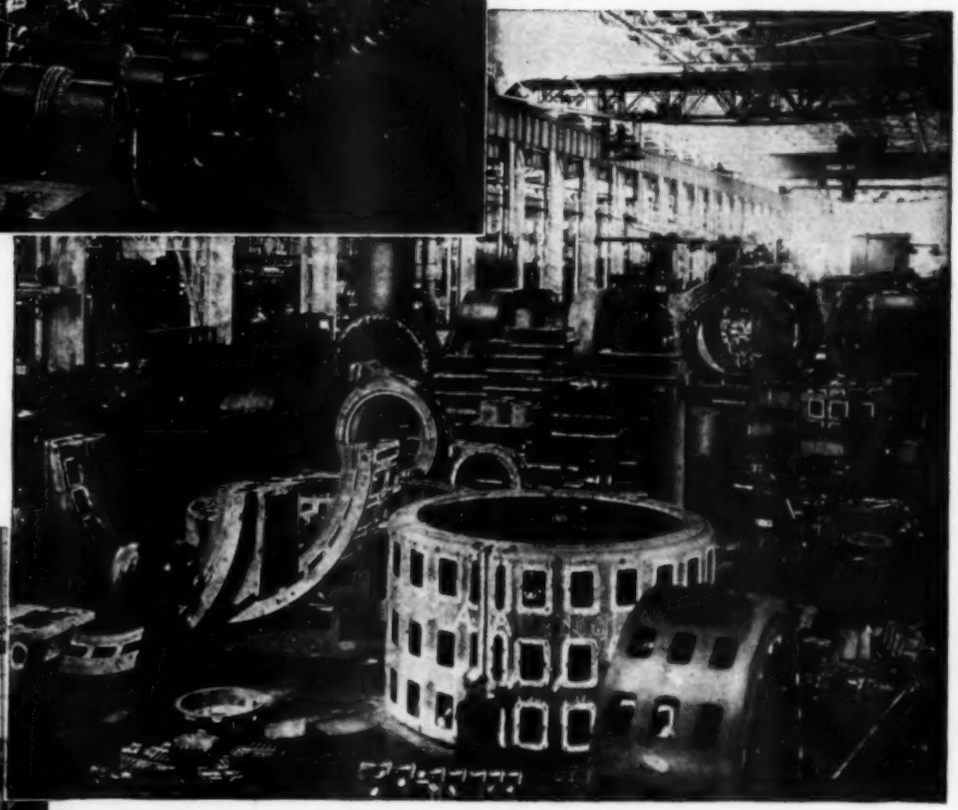


Fig. 9—Large assembly floor for cores and coils of rotary machines

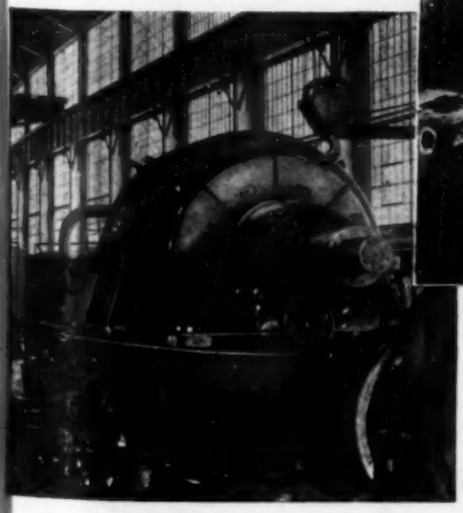


Fig. 10—Another assembly floor for units from 8,000 kva. to 30,000 kva.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been arranged

Quality or Quantity?

"HELLO, Ed. When I came through your department I saw fur all over the floor. Who have you been tangling up with now?"

"Didn't your informant tell you the other feller's name? It seems to me you maintain a pretty good information bureau."

"Your battles are epic, old top, and they are talked about wherever men gather. But what was the trouble between you and Blake? You can't fight with everyone, Ed. By and by, people will think you are to blame, which of course you are not."

"I don't see why people should think I am fighting every time I express a contrary opinion. But I aim to do it whether they think so or not."

"Granted. But why make your opinion so vociferous? What was it this time?"

"Not much. I told Blake not to send any more apprentices into my department. They clutter up the place, and when you want work done they are never there. When they are there they just take their time about doing a job and it puts my work behind. I just can't be bothered with them."

"I see. You are like the Congressman that said, 'Why should we spend money for posterity? What have they ever done for us?' You don't believe that you owe anything to the future, eh?"

"I may owe something to the future, but I have to pay my bills to the present or hunt another position, and every job I give an apprentice is either spoiled or late."

"Why not give them some job that is not on a rush basis?"

"I can't be bothered. My argument with Blake was whether a boy is expected to make time, or quality. They are in the production line and must keep up. If they can't, they should be put in a special department with work that isn't in a rush. A foreman can't run his department and waste his time instructing boys."

"No, and you can't give them the worst tools in the shop and expect a man's work from them either."

Should apprentices be segregated? Should they have separate instructors? At what period of their apprenticeship should they acquire speed? Should we bother with apprentices, anyway?

Foremen are invited to discuss these questions vital to their work; of course the

DISCUSSION OF EARLIER TOPICS

The Ethics of Making a Change

A FACTORY is operated to make a profit—not to provide soft jobs for foremen. Before Ed talks to Mr. Williams about the new offer, I think he should ask himself a few questions and make a careful analysis of himself and his job.

First—How long has he been with the company and how many raises has he been given? He may find that he has been well taken care of when he looks back over the years.

Second—Has he been giving the company increasingly valuable service as he has been raised in pay? Has he handled more men than he did 5 or 10 years ago? Has his accident record improved each year? Has he secured decreased costs in his department? Has he turned in suggestions for improvements to his superior officer? Can he justify his present pay on other reasons than length of service? What can he promise he will do in addition for the 10% increase? Every raise in pay creates added obligations.

Third—Has the irritation which his wife has noticed (and no doubt others also) been caused by Ed's dislike of changes and new methods and his unwillingness to adapt himself to a new order of things? The average man dislikes change, but the man who is a real executive is never satisfied with present methods. "We progress through change." Has he been open minded or narrow and set in his ways?

Fourth—Does he feel sure, after this self-analysis, that he can take the new job and make improvements over his present methods of operation, to justify the 20% increase in wages? He might take the new job and at the mere end of six months be discharged because he was not big enough to hold the highly paid position. The superintendent of the plow works is willing to pay a good salary to the man who can fill the new job in a high class way.

—EDW. H. TINGLEY, *Secretary, National Association of Foremen.*

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Eating During Working Hours

IT IS my opinion that it is better for a foreman to close his eyes to the matter of men eating during working hours. As a former supervisor and inspector, I was too strict about this, which caused some unpleasantness. But one grows wiser by experience. I am now doing skilled work myself, and a change of position changes our outlook and attitude. The more a foreman can shut his eyes to non-essentials and trifles, the better for all concerned.

There are, of course, extenuating circumstances, such as the case of men who cannot eat the first thing in the morning, or one who has to breakfast very early on account of distance. I consider that if the food is eaten unostentatiously, the foreman need not protest or have fears for the discipline of the shop. Output will not suffer.

This subject suggests to me an experiment which is being tried by several French firms, namely, working right through the day with just a slight refreshment between. This might suit both masters and men, inasmuch as loss occurs both before and after the usual dinner hour. Besides men do become drowsy after a hearty meal.

—WILLIAM BRYCE, *Sheffield, England.*

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Mottoes in the Shop

VERY often, too many signs and posters in the shop have the same effect as the screaming headlines of the yellow newspapers. They merely catch the eye of the part of the personnel afflicted with the mob spirit. Any impression made by one sign is buried by a new impression from some other sign. The portion of the rank and file who are able to, and do think for themselves seldom pay any attention to such childish attempts to sway their thoughts.

When the bulletin board is plastered over with preachy signs, and numerous others are hung about the plant, every one gets in the condition of paying no attention to any of them. Thus, by over indulgence, an easy and natural means of conveying information is lost.

—L. O. BROWN, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

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Smoking During Working Hours

AWAY back in 1901 I was employed by a Cleveland concern. Smoking was strictly forbidden and the lavatory accommodation was rather limited. The firm employed a big, husky "guy" whose sole job was to patrol the lavatories and throw out the offenders, and he was a busy man. Resource was then had to chewing, and I believe I am safe in saying that once an automatic was set-up and running with its initial quantity of cutting oil, there was no need for replenishment.

In a Canadian works where I was a lathe hand, the owner kept a particular Havana brand, and visitors were invariably escorted about, pushing these delectably perfumed cigars a good six inches ahead of them into all active departments. Active, is the word. There ensued a general run on the latrine strung across a stream 300 yards away, and the smell of shag or "Navy Cut" would gain the upper hand for an hour or so.

One more episode should complete the answer. A larger, very prosperous works in the North of England, modern and fireproof, presided over by an understanding soul, a gentleman in every sense of the word, allowed smoking at all times. A new works manager, thoroughly

discussion is not limited to foremen. Letters accepted and published will be paid for

vamped by Lady Nicotine, was walking through the works in the company of the aforementioned president. The latter paused slightly, turned to the works manager and said with a barely noticeable twinkle in his eye, "I wish the men wouldn't smoke quite so much!"

A few hours later the works manager sidled alongside a shop steward and said, "The governor is worried about so many lads smoking cigarettes. What about it?"

The shop steward said, "It sure is on the increase. Shall I drop it to the men to smoke only between 9:30 and 10 a.m. and 3 to 3:30 p.m.?"

"Right you are."

The effect was magical. No notices. No fuss; and a further benefit is that the works manager times his visits for a word here and a suggestion there, during the smoking half hour when contentment reigns. A check taken on the ammeter showed no drop in power consumption. Office men and visitors refrain from smoking when they notice the men are not indulging. Those in the know stretch their legs and fill their lungs during the men's smoking interval. Thus another invisible mark is chalked on the door-post as a further indication that kindness and consideration are assured within.

—A. T. FANN, *Huddersfield, England.*

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Compulsory Membership in the Mutual Aid

IT HAS been my experience, as far as mutual aid schemes are concerned, that compulsion to join is unnecessary. The average worker, if given a clear statement of the protection his ten to fifteen cents weekly affords him, requires no coercion. While admitting that the "Joe Fisher" type is to be found in any plant, along with his friend the "shop lawyer," they form exceptions that prove the wisdom of joining the mutual aid. In most plants, benefit schemes, while sponsored by the management, are conducted by the men themselves, with a representative in every department whose duty it is to investigate any claim arising out of sickness or distress, and to enroll new members. It has been my experience, that in nine cases out of ten the new man who refuses to join, comes in for unfavorable criticism from his shop mates, which in itself forms a very good argument against managerial compulsion.

—ROBERT S. ALEXANDER.

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Eating During Working Hours

HAVING worked in a dozen or more factories scattered from coast to coast, it seems to me the most diverse of all shop rules is that in regard to eating during working hours. A fair-sized factory in Los Angeles permits one employee to maintain a large supply of candies and cakes which are accessible at all times. Employees simply help themselves and leave their coin in payment. In warm weather small packages of ice cream are available. Compared to this is the other extreme where the rule calls for the discharge of anyone caught eating during working hours.

One thing I have found common to all shops. That is: regardless of rules men do eat while at work.

Personally, I cannot differentiate between a man reaching into his pocket for a chew of tobacco, and a man reaching into his pocket for a piece of candy.

—BURTON MATTHEWS

Why Conferences Anyway?

A MORE smoothly running organization can be promoted by foremen's conferences in a number of ways. The meeting should, in a sense, be a means of selling the plant and its policies more completely to the foremen. New developments should be presented for discussion and approval. Often material of an educational or inspirational nature is appreciated since this gives the foreman a broader vision of his work. The character of the plant and the type of organization should determine whether technical discussion has enough of a universal appeal to be considered. When foremen are represented on various shop committees, the reports of these committeemen as well as their instruction should form a vital part of the conference.

The man needed to head a foremen's conference of the type outlined above should be one who can direct a well-balanced program rather than merely preside at the meeting. From the standpoint of education, inspiration, and presentation of policy, the logical person for chairman would be a member of the management staff. To encourage unstifled discussion, the most logical person would be from the foremen's group. This suggests that the conference might be treated sectionally, allowing time for all these features under the men best qualified to conduct them. Perhaps a better solution would be to allow the foremen to conduct their own meetings, but with the management directing and planning the program through the foreman-chairman.

—M. F. SAXTON.

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Smoking During Working Hours

MUCH of the discontent that arises in the shop is due to just such little things as smoking by the office men when the same privilege is denied the men in the shop.

The match, cigar, or cigarette of the office man is just as dangerous as that of the shop man. If "Smoking will void our insurance," what difference does it make who does the smoking? I do not smoke, but a sense of fairness leads me to the conclusion that rules for or against smoking in the shop should apply to all, from the head of the organization down to the oiler or porter. Any other policy is bound to cause dissatisfaction. If the office man must smoke, let him do it in the office.

As to allowing a definite time during working hours for smoking—is it necessary? What proportion of the men are so addicted to the habit that they cannot wait four or five hours for their next smoke? Of course, if the management believes a short rest period in the middle of the work period adds to the efficiency of the men either directly or indirectly, then the men should be permitted to smoke, eat, or just rest, under the same conditions existing during the regular lunch period.

—C. H. LATTNER.

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THE · NEXT · TOPIC

"High Rates"

What Coolant Shall We Use?

Discussion

By Wm. H. Oldacre
Director of Research and Engineering
D. A. Stuart & Company

A further interpretation of the A.S.M.E. report on cutting fluids together with some comments on Mr. Lord's summary in a recent issue

WE HAVE noted with considerable interest the article by Chester B. Lord which appeared on page 407 of the March 6 issue of *American Machinist* under the title, "What Coolant Shall We Use?" The replies to the A.S.M.E. questionnaire regarding current practice in the application of cutting fluids make it plain that there is practically no standard practice in regard to this rather important question, and it is evident that this situation is due in no small part to the confusion of terms and the lack of accurate observation of metal-working phenomena.

To start with, we believe that the cooling action of cutting fluids has been considerably over-emphasized and that this over-emphasis has distracted attention from some of the underlying principles of machine tool operation. Our experience of many years indicates that the primary function of a cutting fluid is lubrication and that refrigeration is a decidedly secondary factor, although it sometimes seems to contribute materially to the success of the cutting operation. In this connection it might be noted that emulsions, or so-called "soluble oils," are generally considered to be superior coolants when, in fact, under the most severe conditions such as are represented in quenching a heated piece of metal, they act as very poor coolants. For instance, a piece of steel quenched in a 40-to-1 mixture of soluble oil and water will be softer than the same piece quenched in oil. It is probable that some filming action of the emulsifying agents takes place which interferes with the transfer of heat from the piece to the solution, and it should also indicate that in a cutting operation the cooling action of the emulsion probably takes place on the shank of the tool and on the product, rather than at the highly heated point of contact between the two.

It is rather difficult to classify accurately the wide variety of cutting fluids in use today, ranging as they do from plain salt solutions to heavy compounds of pigment, soaps, and oils. However, every machine operator is acquainted with the general division of soluble oils and straight cutting oils. The soluble oils are products which form emulsions when mixed with water, and according to the emulsifying agents used, may be roughly divided into the soap type, the sulphonated fatty-oil type, and the sulphonated sludge type, which is a by-product of petroleum refining. All of these products, when properly made and mixed with water, produce homogeneous, milky emulsions that are quite generally used on the rougher types of machine work. The soluble pastes are similar in composition to the soap-type soluble oils excepting that they may contain less oil, more water or other inerts, and sometimes may carry fillers such as sulphur, lithopone, and talc.

The straight cutting oils consist generally of animal or vegetable fats, mixtures of these with petroleum oils, sulphurized animal or vegetable oils, sulphurized petroleum oils, or mixtures of any or all of these.

At this point it might be well to distinguish between sulphurized oils and sulphonated products. Sulphurized oils are oils in which sulphur has been incorporated by means of treatment with flowers of sulphur or certain sulphur compounds; sulphonated oils are oils which have been treated with sulphuric acid. The latter are rendered water soluble by the sulphonating treatment, while the sulphurized oils are not much different in their general characteristics from the straight fatty or petroleum oils.

The tendency in recent years has been towards the greater use of the sulphurized oils, since they are low in cost and very efficient. In fact, on operations such as pipe threading, sulphurized oils have almost entirely replaced the earlier fatty oil mixtures. By far the large majority of pipe shops today use sulphurized oils, as it is possible to secure much better results by their use than with the fatty oil mixtures, and at much lower cost.

PRACTICALLY all common vegetable or animal fats possess cutting qualities. Those most generally used are lard oil and sperm oil, as they are easily secured and are fairly low in price. Cottonseed and linseed oil are sometimes used, but as they are drying oils they tend to oxidize and gum up machines. Our experience does not agree with the statement of Mr. Lord that vegetable oils possess a greater lubricating quality than the animal or fish oils. Castor oil, for instance, is very little used in production work, as it is immiscible with petroleum or other commonly used diluents and does not seem to possess any outstanding characteristics which would justify its high cost.

The question of viscosity seems to be of minor importance in production machining. To prove this, we have varied the viscosity of a satisfactory cutting fluid from a Saybolt reading of 50 sec. all the way to 400 sec. at 100 deg. F. without making an appreciable difference in the performance on the machine. This fac-

tor of viscosity may be affected by various psychological or mechanical conditions; the average mechanic is much impressed with an oil having plenty of "body," and it is true that sometimes this body, or viscosity, exercises a dampening effect on a worn spindle, perhaps helping to eliminate chatter.

It is difficult to define the function of sulphur in a cutting lubricant. Certain it is that it prevents seizure. Recent tests with specially designed testing equipment in which a revolving rotor bears on a fixed member to which high pressures are applied, indicate that whereas seizure takes place with fatty oils, or fatty oil and petroleum mixtures, at pressures around 6,000 lb. per sq.in., it has been impossible to produce seizure with pressures as high as 20,000 lb. per sq.in., when sulphurized oils are used as the lubricants. This fact would explain why sulphurized oils are superior for threading, broaching, and other operations where very high unit pressures are involved, and where the welding of the chip to the tool is a frequent cause of failure.

It has been our observation that wherever tearing of the surface is encountered in a machining operation, the addition of sulphur or the use of sulphurized oils will result in an improvement or entire correction of the condition. Sulphurized oils, therefore, are very commonly used on the softer, stringy metals, such as chrome-nickel steels and stainless steels. Incidentally, sulphurized oils and various sulphur compounds have also been used with marked success on press drawing tools where welding of the punch and tearing of the sheet metal had previously taken place.

Concerning hardness, it has been our experience that the kind of cutting oil used has very little effect on the successful machining of high-carbon steels, and it is very rarely possible to improve the cutting operation materially by varying the cutting fluid. We question the statement that hard metal has a higher heat conductivity than tough metal, and we know that an extremely conductive metal such as copper is sometimes very difficult to machine. In connection with hard metals, it is of course on these metals that the tool has a tendency to override and slip and not "dig in." Nevertheless, it is not on such metals, but on the softer, stringier metals that sulphur and sulphurized oils have the most beneficial effect.

IT must be kept in mind that in machining the same piece on the same type of machine, conditions may vary in such a way that the cutting oil requirements are rather widely affected. For instance, it is possible to remove the same amount of metal using a heavy feed and a slow speed, or using a light feed and a high speed. In the first instance, the pressures involved are very high and the length of the metallic surface passing the point of the cutting tool is relatively small; in the second, the pressures involved are low and the length of metal passing the cutting point is high. The first condition will require much greater lubricating quality than the second and more trouble will be encountered with burning of the tool, owing to the large amount of distortional heat generated, while the second condition, if any trouble is encountered at all, will result in wearing of the tools.

The questions as to what is the function of a cutting fluid, and what type product is best to use are generally settled with altogether too little careful investigation. Today, the average plant executive either dismisses the cutting fluid question with a shrug and the statement that the business contains a lot of "hokum," or else convinces himself that some one particular product or type of product is the only one that will possibly take care of his particular requirements. If it were possible to secure closer co-operation between the experienced cutting-oil engineer and the experienced machine operator, including much more accurate observation of machining operations, we might expect real progress and increased efficiency in machining metals. In fact, it is surprising to find in how many cases the word of a "good operator" is taken as final in disposing of lubrication questions that have been, and still are, unsolved problems to our greatest chemists and physicists.

The Place of Exporting in Planned Prosperity—*Discussion*

HEINRICH Sonnenberg Aktiengesellschaft, Dusseldorf, Germany, in a letter, questions the accuracy of certain figures in the tables of the article entitled "The Place of Exporting in Planned Prosperity" by W. H. Rastall, published in Vol. 72, No. 4, *American Machinist*. "In examining the figures stated in the various tables, we notice that in our opinion the statistics cannot be right," the letter reads. "For instance, in the Table II, the export from 'Germany' in 1928 to 'France and possessions' is stated to be of $2,632,348. In view of the large delivery of machines which only our firm has made to France, it seems to us that there must be a mistake in this figure. The same refers to the export from the United Kingdom to the various countries. Therefore we shall be glad if you will induce the writer of the article to check his figures."

In answer to this query, Mr. Rastall states, "I can now advise that further reference to the official German statistics confirms the statement as published, with the qualification that the article was based on preliminary figures. The final German statistics show that metal working machinery exports from Germany to France in 1928 totaled Reichsmarks 8,243,000. If we use an exchange rate of 23.82c. this works out to $1,963,482 which is quite a little smaller than the figure I used, but which refers only to France, while my earlier figure referred to 'France and possessions.' Apparently this shows that our statement was accurate if the official German statistics are accurate.

"In our contact with American manufacturers we frequently have similar experiences. It may be that Heinrich Sonnenberg Aktiengesellschaft produces other than metal working machinery, in which case their shipments would not perhaps come in this classification. Again, we sometimes find that manufacturers have not properly declared their shipments, and consequently, the statistical authorities are forced to place them outside of the categories to which they might more properly belong.

"Be all this as it may, we can merely fall back on the official German statistics as justification for the figures in the above article."

Spark testing has been used for sorting mixed tool steels of similar appearance. It should not be used to test the quality of steel, for it will not detect laps, cracks, or seams, nor will it determine hardness or grain size.

Athletic teams are a feature of the training given apprentices at Newport News

Training by Intention

By G. Guy Via
Superintendent of Training,
Newport News Shipbuilding and Dry Dock Company

THE SHOP is not usually a very satisfactory place for the average boy to concentrate on mathematics and science. And yet he must be proficient in them to become really competent at his work. These classes are best arranged far away from din and confusion. Even so there is a marked tendency to conduct them during working hours, rather than at night. At Newport News each boy is required to attend the apprentice school classes six hours per week for a period of three years. Not only are these classes held during working hours, but the apprentice receives his regular rate of pay while in attendance. Shop arithmetic, algebra, geometry, trigonometry, mechanics of materials, physics, English, industrial economics, shop sketching and mechanical drawing, with numerous problems and illustrations taken from regular "yard" practice, afford a wide field for educational endeavor, and the required passing grade of 60 per cent challenges the best efforts of each student. A recently remodeled brick building has been entirely devoted to the needs of the apprentice school, and admirably serves as a focus for all apprentice activities other than actual shop training.

An unusual feature here is the method of grading. As in the shops, each lesson is carefully prepared in advance, and the student is always required to submit a paper which is not only complete (no omissions allowed) but correct as well. The grading is arrived at by a comparison of actual time required to finish the completed exercise with a predetermined standard posted in each room. As all unessentials have been eliminated from each course, such a system of grading inculcates habits of thoroughness and accuracy which are so very desirable in every kind of endeavor.

The school is open all day, and classes are in session from nine in the morning until four in the afternoon. The faculty is composed of carefully chosen college graduates, each a specialist in his field. These men not only teach, but direct and supervise many extraneous activities as well. The apprentice school is one of the busiest spots in the yard, and it is proper that it should be. Sloth is no aid in developing the head of the young.

The Heart is reached in many subtle ways. In the first place, it has been found that the complete segregation of the apprentices in the various crafts under the leadership of the shop instructors tends to elevate the morale of the group, and also places them on a competitive basis with the journeymen. An apprentice greatly relishes bettering a craftsman's record, and competition among the learners themselves lends zest to their endeavors. Accordingly, miniature shops completely equipped are being set up all over the yard, dedicated to training purposes. The resulting increase in craft pride is most gratifying.

Athletics exert a tremendous influence over the boys. The company is not asked to provide funds for this program, but the apprentices themselves take care of an annual budget of approximately $10,000. A new athletic field, dedicated last September, was built by the boys themselves after work hours under the leadership of their instructors, the company providing only land and material. The apprentice athletic association borrowed $3,500 to install flood lights, and have presented their community with a most up-to-date field, complete even to radio broadcasting.

EVERY season the boys offer excellent teams in football, baseball, basketball, track and boxing. Coaching is voluntary, and the development of the different teams is assigned to various members of the faculty. Matches are arranged for only with teams from other recognized schools, and emphasis is at all times placed on clean sportsmanship and fair play. Surely, no more potent influence for right-living and right-thinking can be found.

An Apprentice Honor Council of ten members guards jealously the good name of apprenticeship not only within the plant, but outside as well. Their recommendations in all matters of discipline are invariably accepted, and individuals are careful to regulate their conduct so as

The band is another example of the manner in which Newport News apprentices are reached through the heart

not to conflict with the high ideals which have been set up by this group. The Honor Council has banned all sporadic shop initiations for new boys which in years past have proved so obnoxious and troublesome. Instead, it conducts a well-regulated ceremonial on its own account at more or less regular intervals, which is thoroughly enjoyed by everyone, even the initiates themselves. The Honor Council has developed into a preventative institution rather than a punitive, and once again faith in boyhood is justified.

Habits of thrift are fostered through an apprentice savings club, which has accomplished much in this direction. Many a young mechanic owes his financial start to this institution. An annual division of $10,000 would indicate that apprentices can and do save—a prime step in good citizenship. Much of this money is reinvested in the "Save-the-Savings Club" at 5 per cent as a nest egg for eventual financial independence. To this nest egg is added the bonus of $100 which the company gives each apprentice upon the completion of his course, thus substantially increasing the boy's financial stake at the threshold of manhood.

Apprentice rings, pins, caps, pennants, stickers, etc., all have a part in building up pride in the organization. These are all of distinctive design, and their purchase is limited to those who possess certain requisites as regards length of service, etc. An apprentice band of thirty pieces has for some years past rendered public concerts enjoyed by hundreds. An active alumni association of two hundred members bridges the gap between apprentice and journeyman and lends encouragement from many angles. Once an apprentice, always an apprentice. What an easy way to solve the sometimes difficult relations between management and worker when years of close association and understanding have built up such mutual confidence and respect! Unworthy notions and false doctrines find it difficult to survive in such an atmosphere, where the idea of square dealing is ever paramount. A clean heart always characterizes a man of honor.

Hand, Head and Heart—the three great objectives in training. Due attention to these three can but result in proven skill, tested knowledge, genuine friendship, sincere respect, and finally, substantial citizenship.

Just What is an Apprentice?—*Discussion*

By A. W. Forbes
Forbes & Myers

C. D. FREUND, on page 181, Vol. 72, of *American Machinist*, expresses surprise that there is no general agreement about the answer to the question. "Just What is an Apprentice?" The history of the usage of the word "apprentice" gives no satisfactory answer, but it does explain why there is no agreement.

Aside from the variations, when apprenticeship was primarily a method of teaching a business, the dominant features have usually been the following: (1) Masters or instructors were independent business men or employers. (2) Apprenticeship was prepared for independent business management, or when it was recognized by membership in an organization, it was an employer's organization. (3) The apprentice was paid a full living wage during the whole period, usually in the form of food, clothing, or some similar item, seldom, if ever, in the form of money. (4) The apprentice was bound by an indenture which required him to work for his employer for a term of years after his trade was learned at less than he earned, in order to pay the employer for the time when he earned less than he was paid.

Modern industry does not want to continue a single one of these central features of old-time apprenticeship. It wants to give an entirely different form of industrial education, and it wants new names descriptive of the various kinds of programs. With the old meaning obsolete, with no accepted program as a substitute, is there any cause for surprise that each employer has used the word apprenticeship to mean what he wants it to.

The Wisconsin definition, as quoted by Mr. Freund, seems to me about the most satisfactory definition of modern apprenticeship. Yet it has certain defects. It limits the age of apprentices to from 16 to 20 years inclusive. This is proper in a law regulating apprentices, but it is not in place in a definition. Also this definition does not relate the work and the intruction. According to the Wisconsin definition, the boy who receives a scholarship at a trade school in return for selling magazines is an apprentice. So, using the Wisconsin definition as a base, I would like to suggest the following as a definition for the word "apprentice":

"An apprentice is any person who enters into any contract of service, expressed or implied, whereby he is to receive through his employer, in consideration of his services in whole or in part, instruction in the trade, craft, or business at which he is employed."

IDEAS FROM PRACTICAL MEN

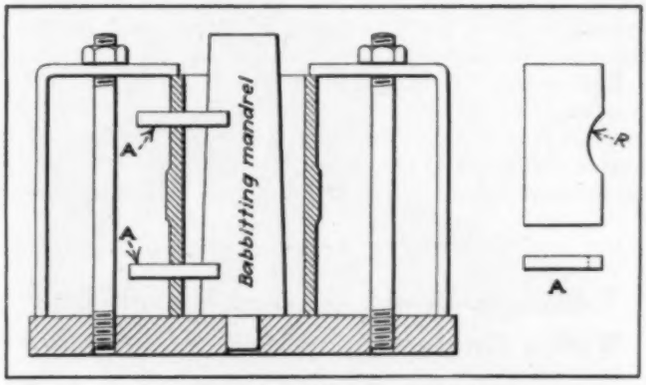
The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Maintenance of Motor Bearings

By DON R. HAMMITT

Chief Engineer Portland Forge and Foundry Company

WHEN the repair department is called upon to recondition a motor, the bearings of which have failed from insufficient lubrication, or from natural wear, the question arises whether they be replaced with new standard bearings? If the motor has had insufficient lubrication, it will be found that both the journals



Fixture and mandrel for babbitting motor bearings

and the bearings have been scored or worn to a point where new bearings of standard size will be too loose, letting the shaft and the rotor down, so that the motor will start hard, heat, and have insufficient power. If run in this condition, the field would burn.

The next question is, should a new shaft and a new set of bearings be installed? While these replacements would make the motor O.K., it would mean that we would have to carry a stock of standard parts for all the motors in use. In our plant, where the motors are subjected to more or less severe service, we have adopted the following method of reconditioning journals and bearings: When a motor goes out of service through bearing trouble, the shaft, with the rotor assembled, is placed between centers and is checked to see if it has been warped or sprung. If the shaft is found to run true, the journals are trued up, taking just enough stock off of the worst worn one, usually the pulley end, to clean up and give a good finish. If the rotor is too large to swing in the grinder, the work is done in an engine lathe.

The bearing sleeves are next removed from the housings and are chucked true from the outside. They are then bored $\frac{3}{16}$ in. larger than the finished journals. They are then heated to a heat sufficient to melt solder and are tinned on the insides, using a flux of muriatic acid and zinc. The bearings are now ready for babbitting, and a good grade of high-speed babbitt is used. Pieces of cork pine are cut to the shape shown at *A*, and are used to stop off, or core, the oil-ring slots, the radius at *R* being the same as that of the babbitting mandrel.

Success of the babbitting operation depends upon the careful heating of the mandrel, the bearing shell, and the base of the fixture. The babbitt, too, must not be overheated. The mandrel should be of a size that will insure plenty of thickness of babbitt in the shells. After the shells have cooled, they are chucked and bored true with the outsides, care being used to avoid distortion in chucking. They are bored to a smooth running fit on the journals and are then ready to have the oil-ring slots filed out and the oil channels cut, upon the completion of which they will be ready for assembly.

Repairs of this kind can be repeated several times before it is necessary to replace the rotor shaft with a new one. Sometimes it will be found that the bearing sleeves are cracked or broken. If such is the case, new sleeves must be made. If they are made of steel, they will give as good service as if made of the more expensive bronze. On very large bearings, it is advisable to drill, or cut, anchor holes in the shells to assist in holding the babbitt.

Colored Inks for Drawing Clarity
Discussion

By W. ROLAND NEEDHAM

Engineer, Design Dept., English Electric Company, Ltd., London, England

Referring to the article by Morton Schwam, under the title given above, on page 193, Vol. 72, of the *American Machinist*, I do not think it offers great advantages as far as ordinary drawings are concerned, though it may in special cases. Most people to whom drawings are issued do not receive the original drawings or tracings, but blueprint copies of them. While there is some slight distinction in intensity in the blueprint as between the lines due to different colored inks, it is not sufficiently marked as to be conclusive.

Since the use of different colored inks takes up some additional time and the advantages are not very pronounced, I certainly prefer the more prevalent method of distinguishing between the ordinary construction lines of the drawing and its dimension and shade lines, by differing the thickness of the construction lines and breaking the dimension lines. Thus, bold lines should characterize the construction, the shading lines for sections should be fine, while dimension lines should be distinguished by thin, dotted lines. These differences, however, are generally taken care of by the tracer, in cases where a separate tracing staff is employed, so that the draftsman does not need to bother about them.

Nearly all British draftsmen would consider that such lines would give all the distinction necessary. Generally, they would prove to be adequate.

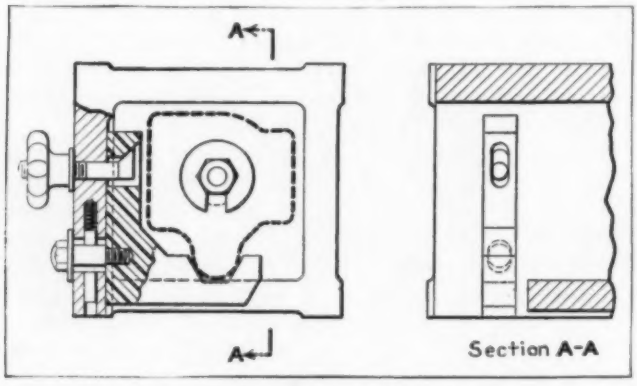
However I once came across a method of coloring lines in order to distinguish pattern makers' particulars from those of the machinists. We felt at the time that the work entailed in reproducing these colors on whiteprints or blueprints was unnecessary. We think so still.

A Wedge-Operated V-Block

By Albert Feucht

In designing a box jig for a casting that had to be drilled from several sides, it was necessary to locate the work from a lug on one side, and at the same time, to keep the corresponding sides of the jig free from any operating devices.

The V-block is held in place in a machined slide in



Jig with wedge-operated V-block

the side of the jig by a collar screw inserted through an elongated slot. A plunger, backed by a stiff spring, presses against this screw and returns the V-block to the loading position when the wedge bolt is released. The casting is held on a stud passing through a previously drilled and reamed hole, the lug being located circumferentially by the V-block. When the wedge-headed bolt is drawn up, the V-block is raised and engages the lug, bringing it into the proper position.

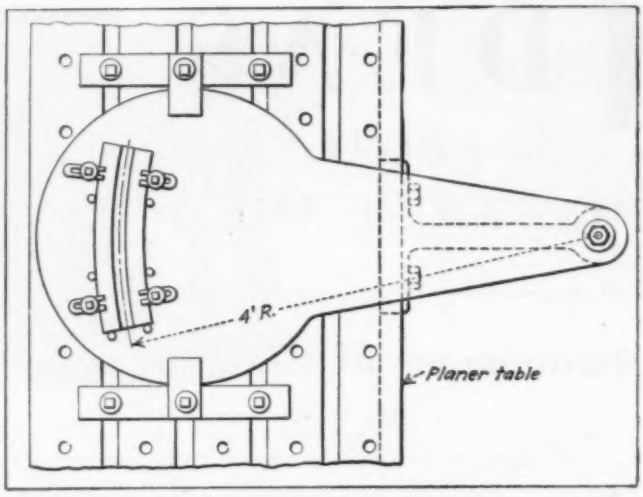
Fixture for Planing Circular Grooves

By H. L. Wheeler

A cast iron quadrant, having a circular groove $\frac{3}{8}$ in. deep by $\frac{1}{2}$ in. wide, was required in lots of one hundred pieces. Machining the circular groove, which has a radius of 48 in. presented some difficulties to produce economically. After trying several suggestions, that were made by men in the shop, the fixture here described was made, and used successfully.

The fixture consists of a circular bed plate having an arm which swings on a shouldered stud which acts as a pivot. This is screwed into a supporting bracket, which is bolted to the side of the planer bed.

Two guide strips are bolted to the platen and butt against the circumference of the fixture and serve to operate as the platen moves along its stroke. Straps



Set-up for planing grooves

are used to prevent the fixture from lifting when in use.

Four guide pins and two stop pins are provided to locate the work in position in relation to the radius of the groove and simplify the setting of each piece. Four small U straps are used to hold down the work. A grooving tool of the proper width is used, and fed into the work in the usual way.

The circular section of the fixture is finished to a true circle at the point where it bears against the guide pieces. It is also finished top and bottom. As the platen moves forward and reverses it causes the plate to swing on its pivot and the resulting cut is made to a true radius.

Cutting a Double-Thread Wormwheel With a Single-Thread Hob—*Discussion*

By John Thomas

In an article by Charles B. Irmer, under the title given above, on page 232, Vol. 72, of the *American Machinist*, the author notes that the worm and the wormwheel did not seem to mesh properly when fitted together.

While a wormwheel can be cut by the method described, the action of the teeth will not be perfect. On first thought, it would seem that so long as the single-thread hob was set out of line so that the helix angle of the hob would coincide with that of the double-thread worm, everything would be all right. Such, however, is not the case. It must be borne in mind that the curvature, or spiral, of the teeth differ. Since the lead of the double-thread worm is just twice that of the single-thread hob, the spiral cannot be the same when produced on the same pitch diameter. The helix angle produced by the hob, and that of the worm in action, may be the same, but the curves differ. If the teeth cut by Mr. Irmer's method have little or no backlash, it will be found that the worm and the wheel cannot be mounted at the proper center distance, indicating that the teeth would have to be cut undersize, as is the case.

Another error is due to the fact that the projection of a tooth cut by a single-thread hob cutting a double-thread wormwheel, does not have an ellipse of the same minor axis as does one cut with a double-thread hob. While both hobs will have the same pitch radius, their axes while in action do not coincide. The practical result is

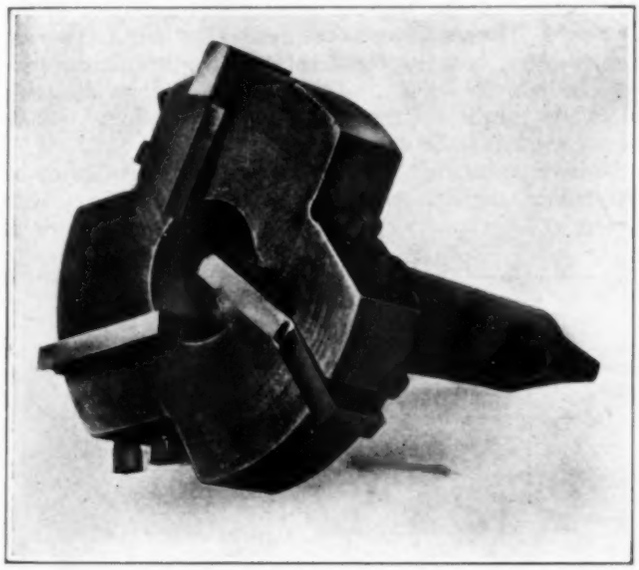
that the teeth of the double-thread worm will bear on the outer ends of the teeth of the wormwheel, causing them to wear rather rapidly until a more full bearing is produced.

The method of cutting a double-thread wormwheel with a single-thread hob is well worth keeping in mind for use in cases of emergency, or for repairs, and may easily be the means of saving the cost of a proper hob. However, due to the errors indicated above, it is not to be recommended where the action of the worm and wormwheel should be as nearly perfect as is possible.

A Tool for Facing Large Nuts

By J. H. Hahn

The illustration shows a home-made facing tool designed for facing and chamfering large knuckle-pin, wristpin, and crosshead-pin nuts for locomotives. This tool is especially useful for handling work on drill



Roughing, finishing, and chamfering are done simultaneously

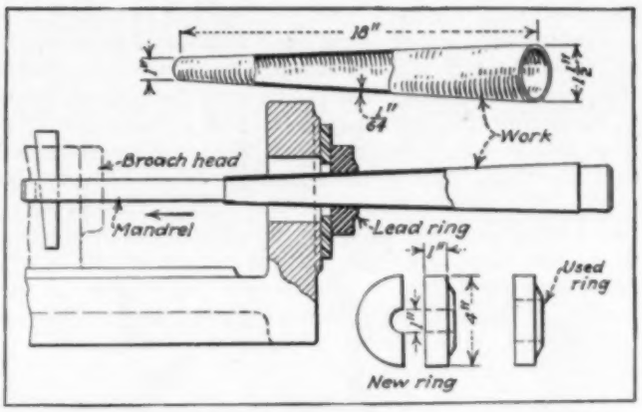
presses in small shops where extensive machining facilities are lacking. It has also been used on bolt-threading machines by screwing the nuts on a mandrel, held in the head of the machine, and clamping the tool in the jaws.

There are three blades or cutters in this facing tool which are held in position by setscrews. Each cutter is ground differently to perform one of the three operations; roughing, finishing, and chamfering. This facing tool will be found useful, not only in railroad shops, but also in general machine shops.

Ironing Out Tapered Tubes

By L. L. Locke

Recently, we had to make a large quantity of sheet-metal tubes, 18 in. long and slightly tapered, the diameter at the small end being 1 in., while at the large end it was 1½ in. The metal from which the tubes were made was $\frac{1}{64}$ in. thick. The method of manufacture



How the tubes were ironed out

was to form half-tubes by passing the metal through bending rolls and then to solder the halves together.

One of the requirements was that the surfaces of the tubes were to be smooth, but in the process of manufacture it was impossible to prevent some wrinkles from forming, and the surfaces were not otherwise entirely smooth. To overcome these objectionable features, the tubes were ironed out in a broaching machine, as shown in the illustration. A tube was put on a tapered mandrel, which in turn was attached to the sliding head of the machine, a ring of cast lead, 1 in. thick, having been previously placed over the mandrel behind the tube.

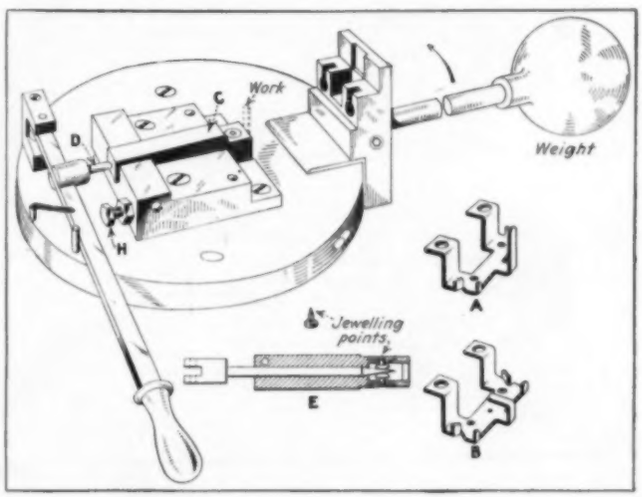
When the mandrel and the tube were drawn through the lead ring, the hole in the ring expanded, and the resistance to expansion ironed out the wrinkles and made the surface of the tube smooth. A new lead ring was, of course, required for each tube. After use, the rings were melted and new ones were cast from the old metal. Soap was used as a lubricant.

A Bending and Jeweling Fixture

By Charles H. Willey

Asst. Plant Supt., Hoyt Electrical Works

Each new type of movement support for late types of automobile dash-instruments requires the design of new tools. One such tool, for bending and jeweling the movement support for Chevrolet ammeters is shown in



Fixture for bending and jeweling supports for ammeter movements

the illustration together with the jeweling points.

The support before being bent and jeweled is shown at *A*, while at *B* it is shown after the work has been completed. The support is placed over the pivoted block *C* containing the jeweling tools, and connected to the lever at the left. Raising the handle end of this lever tips the block into a horizontal position, holding the work. The weighted lever at the right is then brought into vertical position, bringing the pivoted forming block at its end down onto the vertical tongue of the work, bending it over and on to the jeweling points in the block *C*. The jeweling points are moved outward by the tapered end of the plunger *D* when the lever at the left is moved to the right.

The mechanism for controlling the jeweling points is shown at *E*. The adjustable stop *H* regulates the depth of the impression made by the jeweling points. The production is from 600 to 700 pieces per hour.

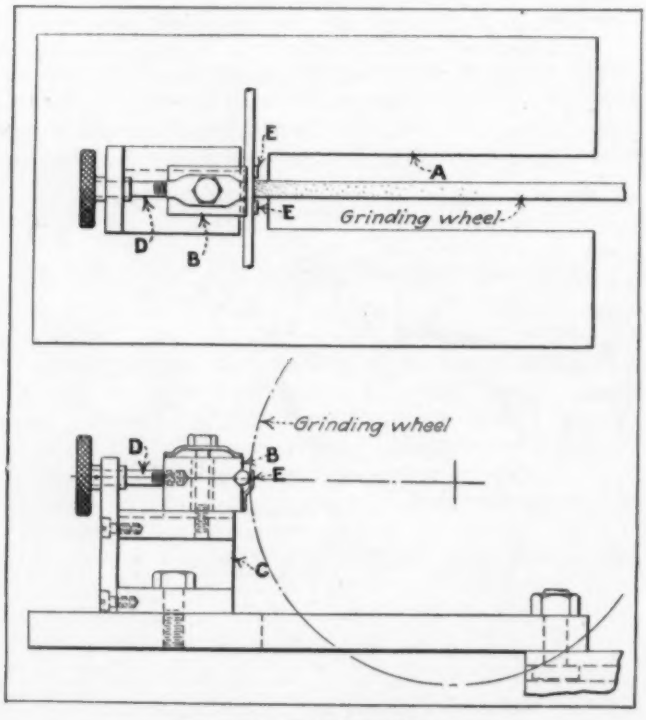
An Improvised Grinding Fixture

By H. F. Fiedler
Foreman, New Era Manufacturing Company

We manufacture several types of perforaters for paper, which are brought in to us from time to time for repair. In one type, there are four rows of punches, 125 in a row, each row working in a die having 125 holes, 0.039 in. in diameter.

When the punches become tapered and the dies become bell-mouthed after long use, it is the custom to lap the holes in the dies to make them straight, and to make new and larger punches to fit them. The punches are made of drill rod, each new set being approximately 0.001 in. larger than the set it replaces. Sometimes we can pick out drill rod of a size to fit the dies after they have been lapped, but more often we have to grind off a few thousandths or so.

For grinding, we made the fixture shown in the illustration, and mounted it on a universal grinder. The fixture consists of: a plate cut out at *A* to admit the grinding wheel; the V-block *B* fitted to slide in the casting *C*, being frictionally held by a flat spring on top; and the screw *D* for feeding the V-block toward the grinding wheel.



Fixture for grinding drill rod

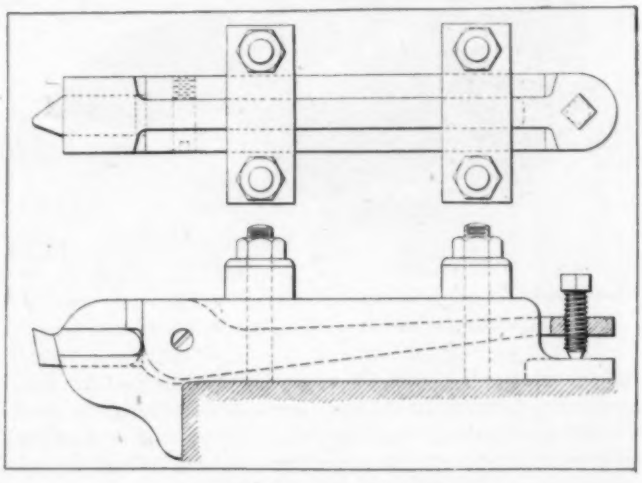
One end of the drill rod is placed in the V-block where it is held by the flat springs *E*, the other end being held in a spring collet in the machine spindle. As there is very little to be ground off of the rod, one pass in front of the wheel generally does the work.

A Toolholder for High-Speed Toolbits

By J. T. Towlson
London, England

A rather original type of toolholder for holding small toolbits of high-speed steel, Stellite, and tungsten-carbide-cobalt alloys is shown in the illustration. The toolbits can be removed, replaced, or changed in position without disturbing the setting of the holder in the machine. The objective in the design has been to provide a toolholder, having considerable strength, yet comparatively light in weight. The body is held on the toolblock by means of the usual clamps employed where heavy work is to be done.

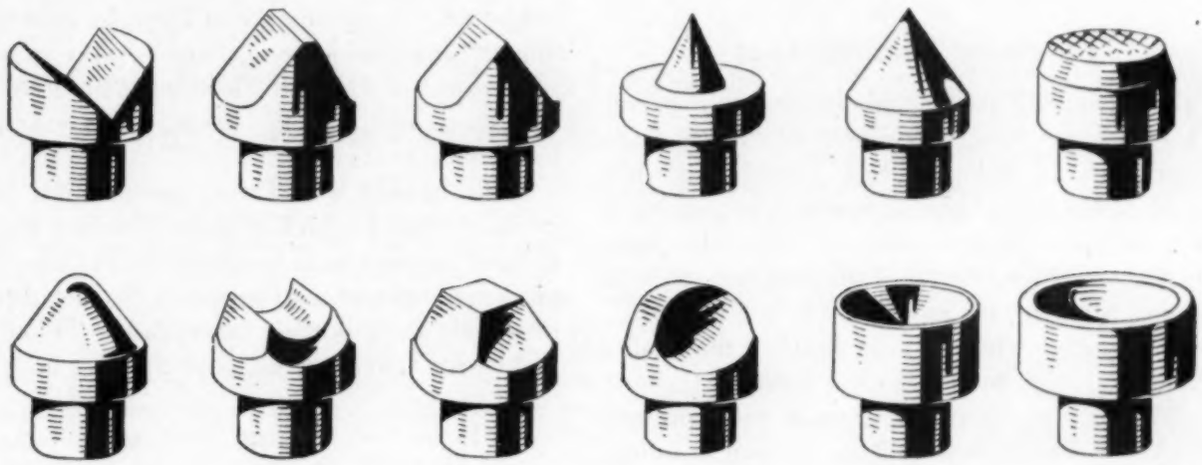
A steel clamping lever is pivoted near the front of the holder, the rear end being widened, and fitted with a screw for clamping. The front end of the lever is also widened so as to cover the full area of the surface on which the toolbits are clamped. The unusual length of the lever permits great pressure to be brought upon the toolbits. In the plan view, a toolbit is shown in place for ordinary turning, but it may also be set in a number of angular positions for various kinds of work. Of course, one toolbit only is used at a time. The surface upon which the toolbits are clamped has shallow, close-fitting slots to receive them and to prevent them from moving under pressure of the cut.



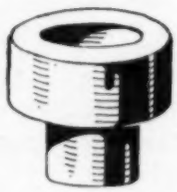
A toolholder of novel design

Lead mattresses between the foundations and the steel framework of tall buildings are said to be excellent shock absorbers. In one New York skyscraper about 55 tons of the metal have been used in this way.

Planer, Shaper, or Miller Jack

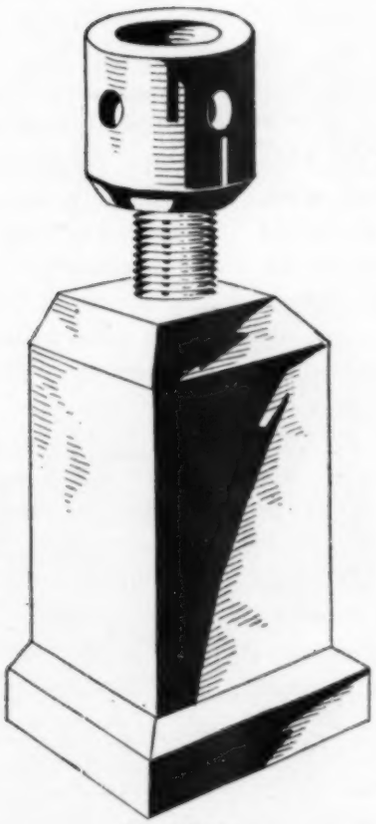


Jack Heads

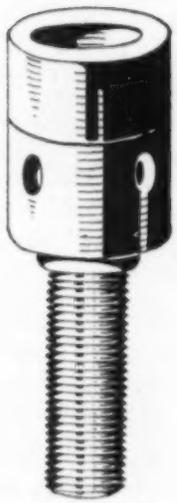


Short Extension

Long Extension



Jack Base



Swivel Head

BECAUSE of unusual surfaces or angular set-ups, shop jacks of the usual types are sometimes found inadequate for proper setting up of jobs. The various shapes of jack heads and extensions illustrated, together with the base shown, have proved their value in service for general work. Any shop mechanic can easily make his own set to suit the types of work he is called upon to handle.

Contributed by Charles H. Willey, Assistant Plant Superintendent, Hoyt Electrical Works

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Vol. 72 NEW YORK, MAY 8, 1930 No. 19

Foreman Training Lags

REPORTING for a committee at the Metal Trades meeting last month Harold S. Falk remarked that although this organization has record of but two thousand foremen in training it leads all other fields in this activity. His point was that, commendable as is the progress made in training foremen, the movement is but started.

No executive who has ever watched the results attained through well-organized foreman training would ever think of trying to work with foremen who had not had the advantage of some training, at least. Now that shops are not as rushed as they have been, it would be well to organize training groups or conferences so that when production is once more at the peak it can go ahead with the added efficiency of trained supervision.

*

What of the U.S.S.R.?

NINETEEN months of the Five-Year Plan have scurried by the eyes of a questioning, hesitating, almost querulous world, and the world is still wondering what to think and what to do, in short, what it is all about. That one nation should deliberately mold itself into one gigantic economic, agricultural, and industrial unit is just as startling to the twentieth century as was the American Republic to the eighteenth. Yet the time may come when men will say, "America had her LaFayette, but Russia had her McKee," or Ford, or any one of many honorable names.

One by one, facts regarding Soviet Russia are finding the light of day. The pipe line from the oil fields to the sea becomes ready for operation; the Ford plant turns out its first car; coal production rises 76 per cent above the record prewar 1913 level; oil, 61 per cent above 1913. Even steel gained 37 per cent; power production in the public utilities is now four times greater than in 1913. Many do not yet realize that the Five-Year Plan is already showing concrete, ponderable returns. According to Bogdanov, able chairman of Amtorg, the Plan is ahead of schedule.

Now as never before must the American manufacturer seek facts and weigh them. Since conservative Washington advises trade with the U.S.S.R., only on a strict cash, or near-cash, basis, and shows little sign of opening diplomatic relations, he must rely on his coolest and soundest judgment. In the absence of facts, he must substitute the best opinions available. May it not be significant that General Electric has granted credit for five years, Allis-Chalmers, three years, and Ford, nine years?

After dealing with Russia for the past twenty years, Arthur G. McKee states that the Russians of both regimes have been uniformly "keen, wide awake, competent, and very fair." He adds that their only fault is their impatience. "They have two words for 'hurry up,' and they use both."

*

Good Faith and Good Business

SHORTLY before the first of the year industrial leaders met in Washington to consider ways and means of minimizing the effects of the business reaction which had set in. They pledged themselves to programs of construction and re-equipment that were very promising, and from all accounts they have kept faith and set a splendid example for the smaller manufacturers.

Not only was it in the public interest to keep faith in carrying out these programs but it was good business as well. Any operating man knows how upsetting it is to production to make replacements when orders are rushing, and he knows too that it is very difficult to persuade administrative officers to make replacements at any other time. And, further, in spite of the best efforts and intentions of the equipment manufacturers, the chances are that the machines built and delivered in slack periods will be just a little more carefully built, and just a little more thoroughly inspected.

But in spite of all this, the man who holds the purse-strings often hesitates to spend wisely for needed replacements when little or no cash is coming in from customers. There are organizations that differ materially from this somewhat pusillanimous policy. The philosophy and practice of one of them are discussed in the leading article of the next number of *American Machinist*. May the example encourage others to do likewise.

SHOP EQUIPMENT NEWS

Gridley Model "G-A," Heavy-Duty, Four Spindle Automatic

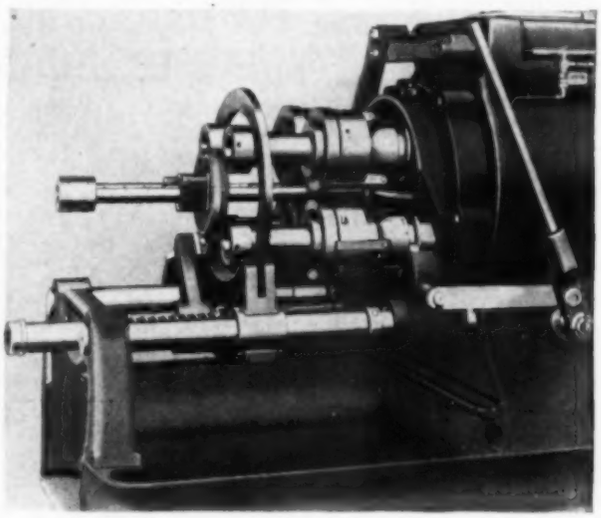
HEAVIER construction to permit greater accuracy at continuous maximum working speeds is featured in the improved four-spindle Gridley automatic built by the National Acme Company, Cleveland, Ohio. This model has a range of spindle speeds from 35 to 500 r.p.m. The feeds with a $\frac{1}{2}$ in. cam range from 0.001 to 0.140 in., so that an ample range of speeds and feeds for all classes of material is assured. Models are available in the following sizes: $1\frac{3}{8}$, $1\frac{5}{8}$, $2\frac{5}{8}$ and $3\frac{5}{16}$ inches.

Four independently operated cross-slides are furnished with each machine as standard equipment. Each slide is supported on the outer edges and rides on hardened strips. The two lower slides are operated by a separate drum directly underneath, and in the center of, each slide. On the outer ends of these drums is an extra set of cams, which operate the top slides. Through this construction, lever connections are eliminated, with a corresponding prevention of vibration and inaccuracy. The cross-slides have been enlarged and strengthened. The two bottom slides do the rough forming, whereas the two top ones perform the finish forming and the cutting-off.

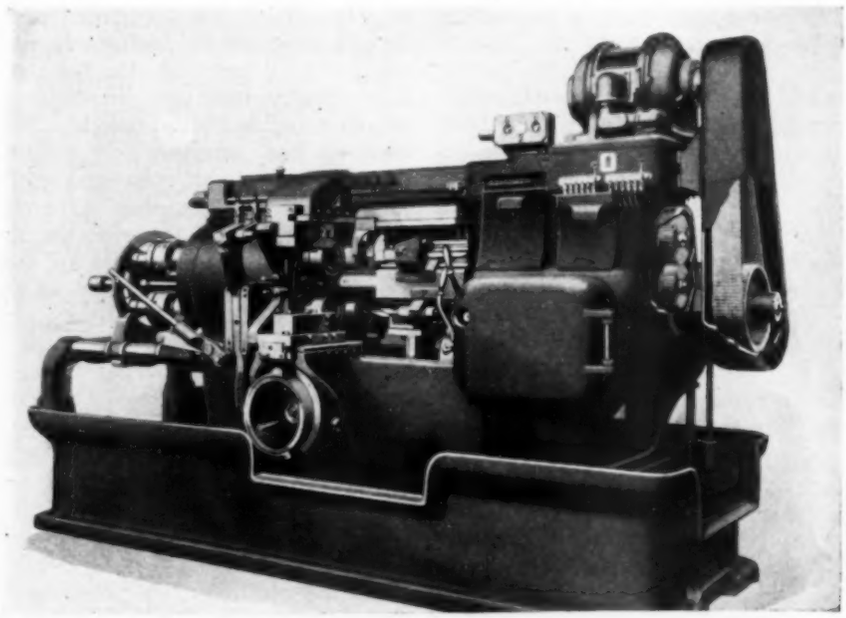
End working tools are carried in a heavier main tool slide, which works back and forth on the stem of the spindle carrier. This main tool slide supports the cutting tool holders, which are mounted on the four corners of the tool slide by means of bolts and T-slots.

The usual Gridley integral construction is employed for the spindle carrier and the main tool slide, being supported by three main bearings, two in the spindle carrier itself, and the other at the extreme opposite end in the frame of the machine. The main tool slide operates on this stem to insure alignment of the cutting tools with the work spindles.

Improvement has also been made in the stock stop, which is of a vertical disappearing type, rigidly supported. The plunger rises and falls, being operated by a cam on the inside of the turret slide cam, which is completely housed. This arrangement permits standard tooling on the fourth spindle the same as on any of the other three positions. The chuck closing slide is supported on the outer end so that no cramping action can take place. All keys in the feed and chucking slides have been done away with.



Support for the stock feed mechanism



Improved Gridley Model "G-A" Heavy Duty Four-Spindle Automatic, which is available in $1\frac{3}{8}$, $1\frac{5}{8}$, $2\frac{5}{8}$ and $3\frac{5}{16}$-in. capacities. The spindle speeds range from 35 to 500 r.p.m., and the feeds from 0.001 to 0.140 inch

The column of the machine, in front of the gear box section, is bored in line with the spindles in the second and third positions to permit the use of high speed drilling attachments or accelerated boring or reaming attachments.

Among the accessories is the pan, which is exceptionally large and is open on all four sides for the easy removal of chips and work. It is unnecessary to stop the machine while removing chips. This pan has

three times the capacity of the old style pan and keeps the oil cool enough to permit continuous high speed operation. The top plate is cast in one piece. The portion over the spindle carrier is cored out, and has a special oil well that supplies lubricating oil to the spindles. The next section is the base or support for the top slides, whereas the section adjacent, thereto and directly over the turret is cored out, and supplies lubricating oil to the cutting tools. The part over the gearbox end of the machine has an oil well for supplying oil to the gearbox. It also provides room for the motor base.

Bolender Model O Gear Burnisher

ONE of the recent additions to the line of gear burnishing machines manufactured by the City Machine & Tool Works, 1517 East Third St., Dayton, Ohio, is the Model O, which will handle gears from ¼ to 2¼ in. outside diameter by ½-in. face. Larger sized gears can be handled by means of slight modifications in the machine.

In Fig. 1 is shown a front view of the Model O gear burnisher, whereas in Fig. 2 there is a close-up view of the burnishing rolls with a gear in place between them, and of the belt conveyor used for handling the work. Many of the gears handled on this machine are of extremely small size, and it is therefore desirable to use such a mechanical loading device to increase production.

The three burnishing rolls are made of hardened steel. Roll *A* is rotated by power and carried on a fixed center, while the two rolls *B* in the rear are mounted on spindles carried on a slide so that they may be withdrawn by pushing down the pedal *C*. When this pedal is depressed, it withdraws burnishers *B*, and at the same time, a link mechanism pulls forward the conveyor belt *D* on which the gears are carried to the burnishing rolls. The link mechanism causes the gear to be carried a trifle past the proper point for engagement with the burnishers. But when the pedal *C* is released, the slide carrying the burnishers moves forward, and at the same time the link mechanism pushes the conveyor belt back against a stop that locates the gear in exactly the required position between the three burnishers. Pedal *E* is then depressed, tripping the air valve which applies pressure to the piston connected with the slide carrying burnishers *B*. In this way a sufficient load is placed on the gear to run it in rapidly. Obviously, it is important that this pressure shall not be too great, and therefore provision is made for obtaining the desired load by means of a regulating valve that cuts the pressure down to the desired amount, as indicated on the dial gage *F*.

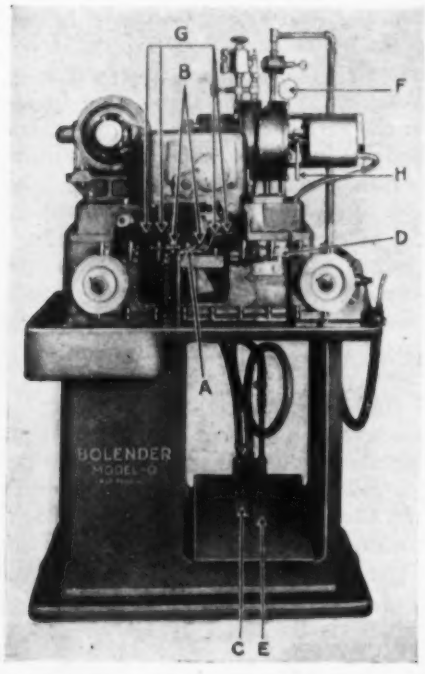


Fig. 1—Bolender Model O Gear Burnishing Machine, which will handle gears from ¼ to 2¼ in. outside diameter by ½-in. face

At the back of the slide that carries burnishers *B* is a micrometer stop. When starting operations on any given gear, this stop is set to an approximate location and a gear is run through, after which it is checked for pitch diameter. By experiment, therefore, exactly the desired setting is secured for the micrometer stop. For handling different sizes of gears, provision is made for adjusting the position of the slide carrying the burnishers *B*. This is accomplished by a screw on the end of the piston rod, threaded into the nut on the slide that carries the burnishing wheels. After this setting has been secured, the slide is clamped by the nuts *G*.

To provide for burnishing both sides of the gear teeth, it is necessary to reverse the direction of rotation of the gear between the three burnishers while the operation is in progress. This is accomplished by a mechanically operated electrical control. To start the rotation of the gear between the burnishers, it is necessary to throw switch *H* by hand. This starts the rotation of the driven burnisher *A*, which runs for a specified number of revolutions. After these, a mechanical tripping device throws a drum-type switch used in conjunction with a magnetic switch. This reverses the direction of rotation on the burnishing rolls and gears through the same number of revolutions, after which the switches are again tripped automatically to stop the rotation. Any over travel of the machine is taken up by the slipping of a friction clutch. An air nozzle *T* is used for cleaning purposes.

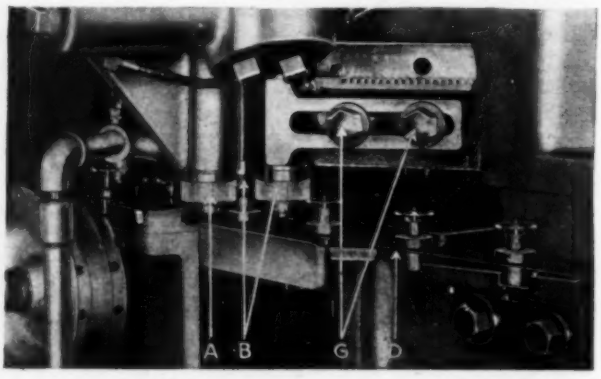
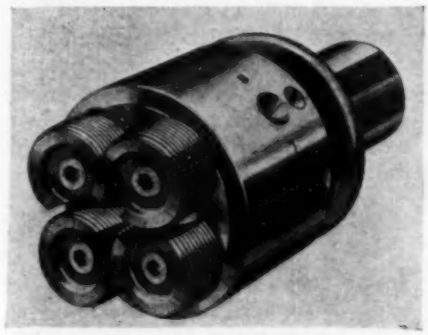


Fig. 2—Studs on the belt conveyor carry the gears into the burnishing rolls

"Namco" Style DR, Revolving-Type, Opening Dieheads

By the use of circular chasers the style DR "Namco" opening dieheads, manufactured by the The National Acme Company, Cleveland, Ohio,



Four circular thread forming tools are employed in the Style DR "Nameo" Opening Diehead to effect unusual production between grinds

can be made to give long runs on parts demanding high accuracy. These dieheads are built for use in automatic screw machines and other machine tools employing rotating die spindles, and are claimed to give minimum "down time." The tools have only three major parts—body, cup, and adjusting plate and all parts are made of special steel hardened, and in some cases ground.

It is claimed that the use of circular chasers gives more than ten times the ordinary life and permits unusual runs between grinds. These chasers are accurate circular thread forming tools mounted upon quickly removable chaser blocks, the faces of which are ground to the exact helix angle of the thread. The chasers are located by serrated steel buttons, and each is held down to its block by a hollow-head set screw. Close-to-shoulder threading is possible, and the positive action of the die in opening makes this a safe practice. Tripping and resetting is effected by the outside fork or inside trip or by means of a combination of both.

Style DR dies are built in six sizes, ranging from a minimum capacity of $\frac{3}{16}$ up to a maximum capacity of $2\frac{1}{8}$ inches.

"Keldur" Vibration-Insulating and Sound-Proofing Material

A resilient, rubber-like material held between layers of coarsely woven jute cloth or burlap is being offered for vibration insulation purposes by the International Products Corporation, 425 Van Buren St., Milwaukee, Wis., under the trade name, "Keldur." Like rubber, it tends to deaden noise and check vibration, but it is not subject to deterioration in the presence of oil and will not harden, according to the manufacturer. It possesses durability against mechanical and chemical disturbances and will retain its elasticity almost indefinitely.

The material can be used for either light or heavy equipment, such as drop hammers, for motors and generators, presses, transmission equipment, prime movers, and all kinds of machinery where noise and vibration are to be held at a minimum. In certain applications like electrically driven household refrigerators, Keldur is used for sound-proofing purposes.

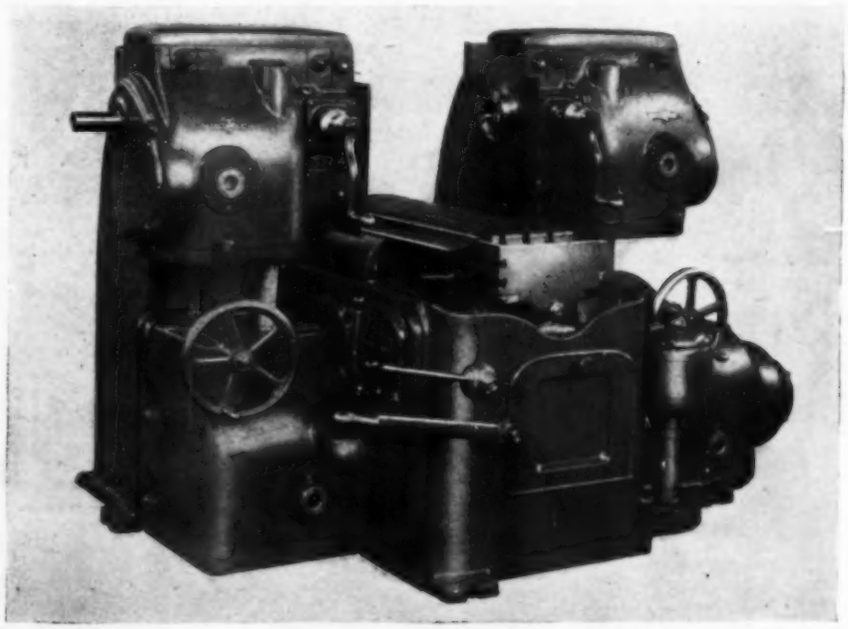
Keldur comes in sheets 28 x 36 in. or $29\frac{1}{2}$ x $40\frac{1}{2}$ in., and in thicknesses of $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{3}{4}$ in. One square foot of the $\frac{3}{8}$-in. material weighs $3\frac{1}{3}$ pounds.

Before the machine is set up, the cut edges of "Keldur" should be lacquered or oiled.

Additional Cincinnati "Hydromatic" Milling Machines

TO THE LINE of production-type milling machines known as "Hydromatics," the Cincinnati Milling Machine Company, Cincinnati, Ohio, has added several more sizes in both plain and duplex styles, making a total of eighteen plain and eighteen duplex machines. This gives a range having table travels from 24 to 90 in., and ratings of 5 to 20 hp., with a variety of combinations in between that makes it possible to obtain a machine with a long table travel but having a low horsepower rating. As will be noted from the following table, these additional machines are now offered in sizes from 36- to 90-in. travel.

The characteristics of the entire line are the same as the regular standard Hydromatics described on p. 1057, Vol. 71, of the *American Machinist*. They may be summarized as follows: Heavily ribbed bed with ample room for chip disposal; Cincinnati locked hydraulic table feed; automatic dog-controlled intermittent table feed; power quick traverse of 220 in. or 300 in. per minute, depending upon the size of the machine; inclosed motor drive; anti-friction bearings throughout the spindle drive,



Cincinnati Duplex No. 3-36 "Hydromatic" Miller, which is the smallest of the models added. It has a table travel of 36 in. and a table width of 12 inches

Sizes added to the "Hydromatic" line

No.	Table Travel, In.	Width of Table, In.	Horsepower Plain	Horsepower Duplex	Weight Plain. Lb.	Weight Duplex, Lb.
3–36	36	12	5	7½	8,300	10,000
34–36	36	16	5	7½	9,500	12,000
34–48	48	16	5	7½	10,100	12,500
35–48	48	20	5	7½	11,100	12,500
35–60	60	20	5	7½	11,700	14,000
36–72	72	24	5	7½	13,000	16,500
36–90	90	24	5	7½	14,000	17,500

with double mounting on the front and rear of the spindle; only four gear contacts in the drive; spindle reverse and cross and vertical adjustments of the spindle; rectangular overarm; centralized control at the left front side of the machine, and an automatic spindle stop.

The plain machine is supplied with the one-way or two-way table feed cycle, while the duplex machine is supplied with only the one-way cycle. The variable feed attachment, positive stop, and delayed trip mechanism can also be supplied with either machine.

Bolender Model 2 Gear Burnisher

LARGER gears can be burnished on the Model 2 "Bolender" gear burnishing machine than on the Model 0 described elsewhere in this issue. The machine has been developed and placed on the market by the City Machine & Tool Works, 1517 East Third St., Dayton, Ohio. On this machine the work is dropped onto a mandrel of suitable form to fit the hole in the gear. This is effected through an opening in the cover. This mandrel is only an approximate locator, so that the gear flows between the masters and is burnished to the pitch line.

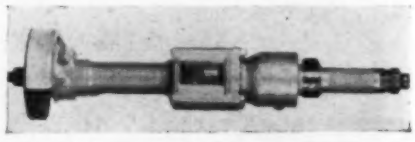
As shown in Fig. 2, burnisher *I* is driven by power and the two burnishers *J* are loosely mounted on spindles carried by a slide. Adjustment of this slide for center distance is accomplished by a crank at *K*, which turns a screw on the piston rod threaded into a nut carried by the slide. Vertical adjustment of the mandrel carrying the gear to be burnished is accomplished through the screw *L*, which is in turn operated by knob *M*. The arrangement of the electric reversing mechanism is the same as on the machine previously described, and the air valve that applies pressure to the burnishing rolls is shown at *N*.

During burnishing, the gears lie in a horizontal position so that there is no overhang or unevenness in pressure due to uneven weight distribution. Air is utilized to furnish pressure and is therefore variable to meet requirements. A constant check by means of a conveniently located dial indicator enables the operator to assure continuous even pressure.

To start the burnishing cycle, it is merely necessary to depress the switch handle *P*, while the air pressure is engaged and disengaged by the lever shown at *Q*. The air nozzle *R* is used for cleaning purposes. At *S* is shown the oil reservoir.

"Hercules" Nos. 320-3 and 323-3, Portable Pneumatic Grinders

Pneumatic grinders in two models differing only in speed have been offered to the trade by The Buckeye Portable Tool Company, Dayton, Ohio. These tools, additions to the "Hercules" line, are known as the Nos. 320-3 and 323-3. They are intended for either vitrified or high speed wheels, the former running at 6,000 r.p.m. and the latter at 9,000 r.p.m. The first uses either a 4-in.



Hercules Grinder, which may be obtained for use at 6,000 or 9,000 r.p.m., driving either vitrified or high speed wheels

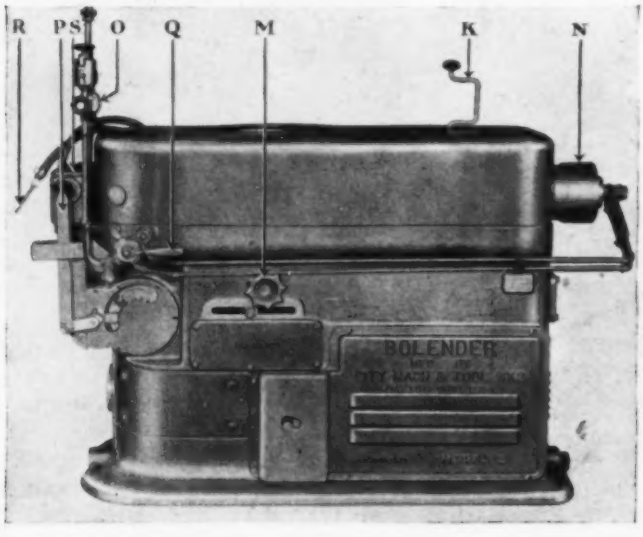
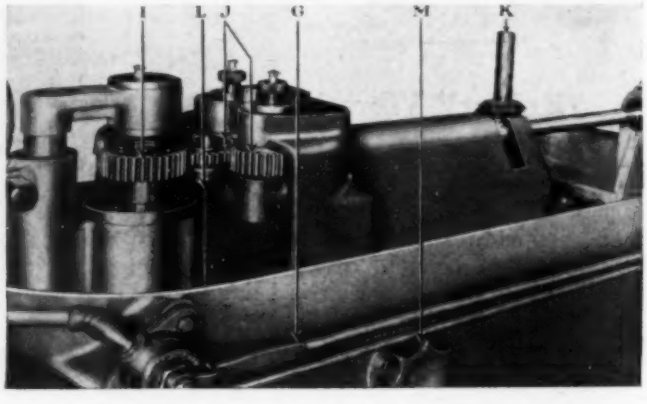


Fig. 1—Bolender Model 2 Gear Burnishing Machine, which has larger capacity than the Model 0

Fig. 2—Adjustment of the slide for the center distance is accomplished by means of a crank at *K*, which turns a screw on the piston rod



vitrified wheel or a 6-in. high speed wheel, and the latter a 4-in. high speed wheel or various small cone and pencil type grinding wheels.

The grinders are 18 in. in over-all length and 3 in. in diameter. Their small size makes it possible to use them in close quarters. Among the special features are the "Hercules" special throttle and governor, and an oil chamber to insure ample lubrication.

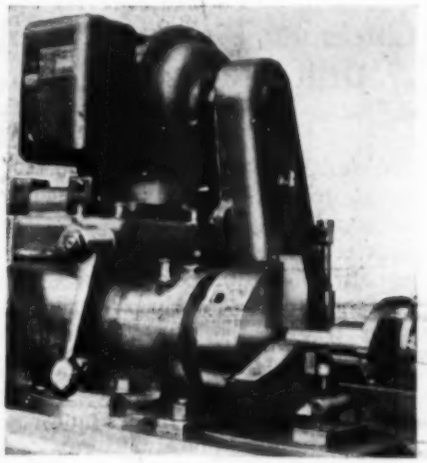


Fig. 3—Soft jaws in the scroll chuck and a V-type locating rest secure correct alignment and prevent marking the finished bearings

EQUIPMENT ADAPTATIONS

Recently Developed by the Makers

Grinding Bearing Holes in an Automotive Crankshaft

Concentric grinding of the clutchshaft pilot hole with the main bearing is accomplished at the rate of 35 to 40 crankshafts per hour on this machine, which has been developed by the Heald Machine Company, Worcester, Mass. Thus alignment is secured between the crankshaft and the clutchshaft. An extra length workhead bridge carries a standard head having a 9-in. geared scroll chuck fitted with soft jaws and a special hinge-type steadyrest. The machine accommodates any length of shaft up to 45½ in. and on the 36-in. machine, illustrated, gives the above production while holding the bore to within 0.001 inch.

The material employed for this crankshaft is vanadium steel, the out of roundness being approximately 0.0003 in., taper 0.0001, and the stock removed, 0.008 inch.

The adjustable workhead aids in maintaining peak production on all sizes of shafts with only short delays for adjustments. A positive stop and dog on the extreme right of the machine prevent over-travel of the wheel.

The close-up in Fig. 3 shows the adjustable workhead, scroll-jawed chuck, and V-type locating rest. A pilot in the base of the head assures correct alignment regardless of its position. Bronze inserts in the chuck jaws (ground out to size) and in the V-rest prevent marking the shaft end, which is previously finished. The motor on the workhead is of the single speed type, as the diameters of the holes in the several crankshafts are approximately the same.

Fig. 2—Showing the clutch shaft pilot hole ground in a vanadium alloy automotive crankshaft

In Fig. 4 is shown the hinge-type steadyrest, which has the jaws fitted with brass plugs, ground to the correct diameter to prevent marking the finished bearing. Adjustment for wear is accomplished by regrinding the plug surfaces and adjusting the jaws, using the centering plug shown in place on the bridge to obtain correct settings of the jaws. The two lower jaws are positioned by knurled set screws and clamped by bolts passing through the jaw to the body of the rest. A sight-feed lubricator is employed.

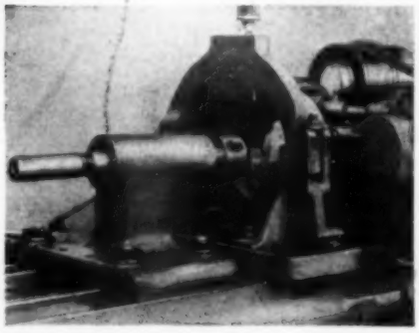


Fig. 4—Close-up of hinged-type steadyrest, which is adjustable for wear

The graduated headstock base and the steadyrest cross-slide facilitate the grinding of tapers.

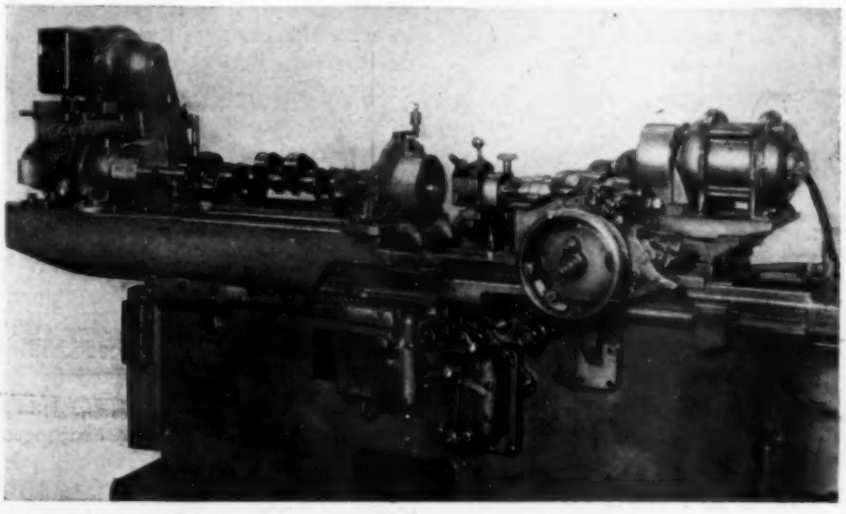


Fig. 1—Heald 36-Inch Internal Grinder arranged for grinding the pilot hole for the clutchshaft in the end of an automotive crankshaft

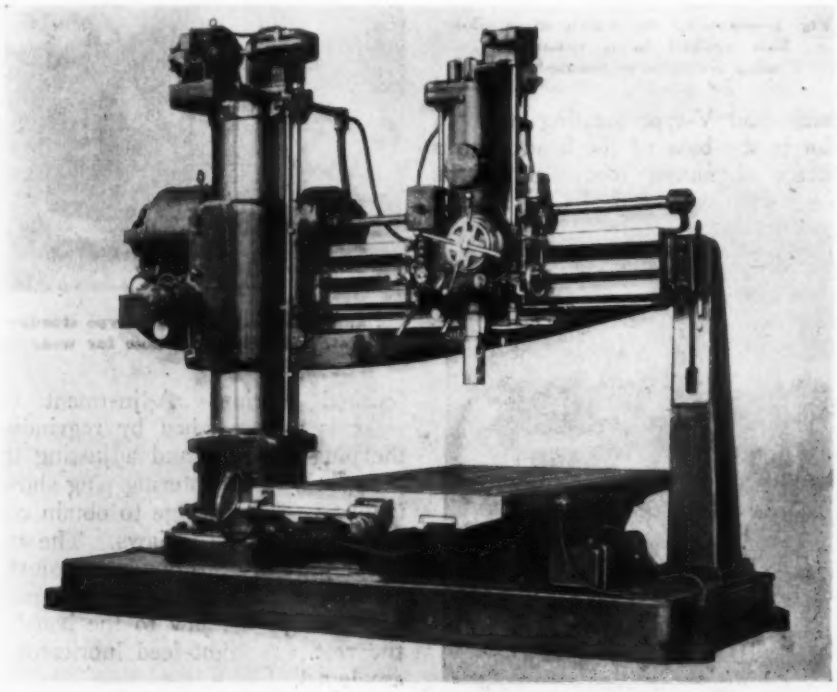
Cincinnati Bickford Radial Drill with Jig Boring Table

Although the special 7 ft. "Master" radial drill illustrated was specially built and equipped by the Cincinnati Bickford Tool Company, Oakley, Cincinnati, Ohio, for the accurate boring and drilling of special printing press frames, the machine also has possibilities for boring and drilling large fixtures and die blocks or machine parts for which it is impractical to make jigs. This machine has a 22-in. column and weighs approximately 48,000 lb. with the equipment shown.

To attain rigidity the outer end of the arm is secured to a substantial supporting column and held in accurate alignment. A special jig-boring table is located on the base of the machine and is provided with power and hand-operated cross traverse mechanism, and fitted with a micrometer dial indicator so that accurate final adjustments can be made. The head is also fitted with a micrometer dial indicator so that precise adjustments can be made.

All controls are located at the head. Spindle speed changes are secured by means of two backgear levers and a rheostat located on the head. A push button controls the clamping and the unclamping of the arm on the column, and a lever under the head controls the vertical movement. The head may be moved along the arm by power rapid traverse or by hand.

For general purpose drilling, the outer arm support and the special jig-boring table may be removed. They are easily replaced owing to the fact that taper pins are employed to locate them in the desired position on the base.



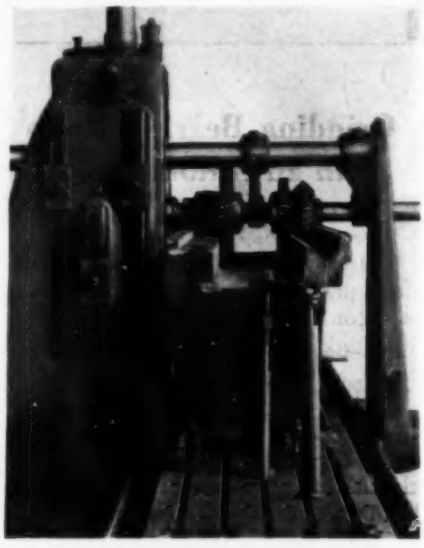
Cincinnati Bickford 7-Ft. "Master" Radial Drill equipped with a special arm support and special jig-boring table. With this equipment the machine may be used for boring and drilling large fixtures and die blocks

Rough Milling Grinder Beds

Rough milling the bearing ways on grinder beds, as shown in the accompanying illustration, is being done on a special 2211 "Mil-waukee-Mil Simplex," built by the Kearney & Trecker Corporation, Milwaukee, Wis. The clamping device is furnished by the customer. One gang of cutters is employed.

The special "Mil-waukee-Mil" embodies all the features of a standard machine. The special head was designed to permit the spindle to be raised to a maximum height of 30 in. above the table. Minimum height is 8½ inches.

The housing is of pyramid design, tapering down on both sides and back making it 8 in. wider and 5 in. longer at the base than a standard housing. The bed which supports the housing is 8 in. wider and the extra 5 in. length limits the cross adjustment of the spindle head to 8½ in. Three bolts are used instead of two to lock the spindle block in the housing. This insures rigidity while cutting at maximum height. All feed and speed mechanisms are standard.

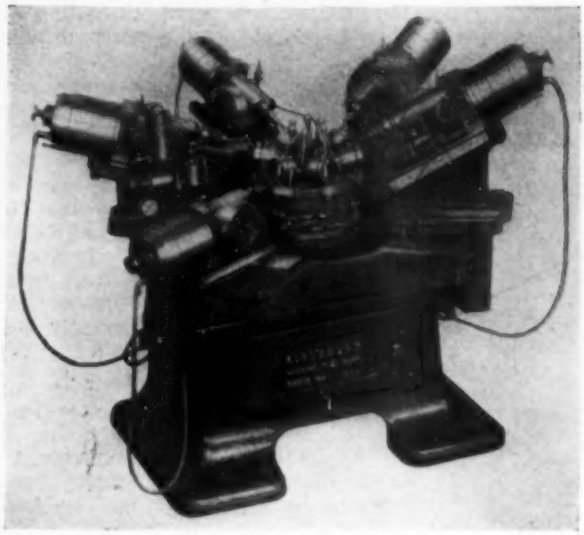


Rough milling flat and V bearing surfaces on a grinder bed

For locating the grinder bed on the table, stop blocks having setscrews are used. The work-piece is placed on the table with its side against the two setscrews, properly locating the surfaces to be milled under the cutters.

Production Drilling, Tapping and Facing with Standard Drilling Units

Five different operations are performed simultaneously on the Type GC semi-automatic dial feed drilling and tapping machine evolved by the Kingsbury Machine Tool Corporation, of Keene, N. H. These operations are the drilling of two oil holes in the bosses of wrist pins, and the drilling, facing and tapping of a setscrew hole therein. The Kingsbury



Kingsbury Type CC Semi-Automatic Dial-Feed Drilling and Tapping Machine, which is arranged for drilling two oil holes in the bosses of wrist pins, and drilling, facing, and tapping a setscrew hole also

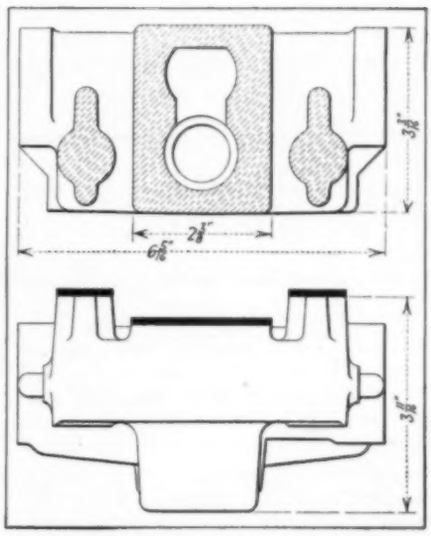
No. 125 hand-indexing fixture was employed and production runs at approximately 600 pieces per hour.

The standard drill-head units are mounted on a standard cabinet base, each head carrying the proper cutting tool for performing one of the above operations. Six work-holding fixtures are mounted upon the standard indexing table. Each time this table is indexed, one piece is completed. The operator changes the work in the sixth fixture while the tools are performing their operations so there is no lost time other than that required for indexing. By following this method a completed piece is obtained in the time required for the longest operation.

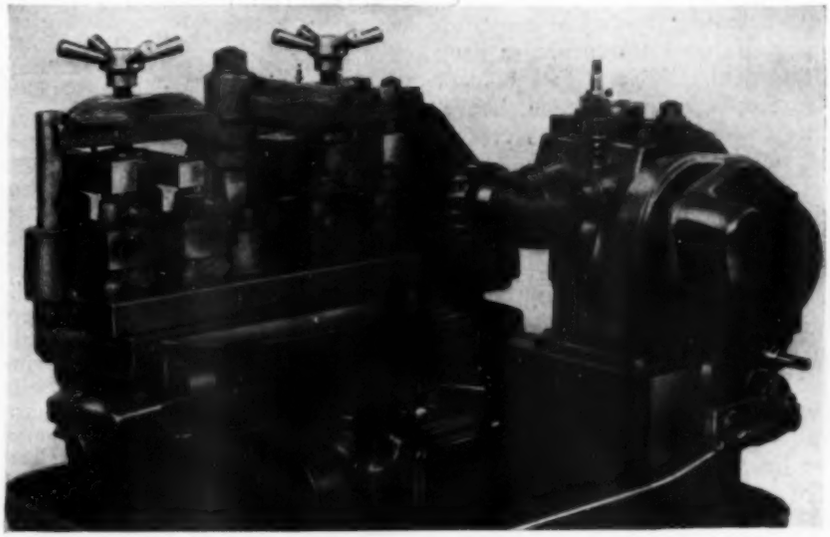
Milling Pads on Shock Absorber Bodies

The equipment illustrated for milling three pads on a cast-iron shock absorber body consists of a standard 18-in duplex Cincinnati miller equipped with a standard 12x24-in. index base having special fixtures mounted on each end of it. Four pieces of work are held in each of the fixtures, with two pieces abreast. Each part is placed over a stud which fits in a $1\frac{9}{16}$-in. tap bore and is located axially (at right angles) from the bottom of a $1\frac{1}{2}$-in. counterbore. Equalizing clamps actuated by a pilot wheel clamp the four pieces of work in place. The equipment was furnished by the Cincinnati Milling Machine Company, Cincinnati, Ohio.

The illustration at the right shows a close-up of the machine and the fixtures, while the work is shown above.



Cast-iron shock absorber body



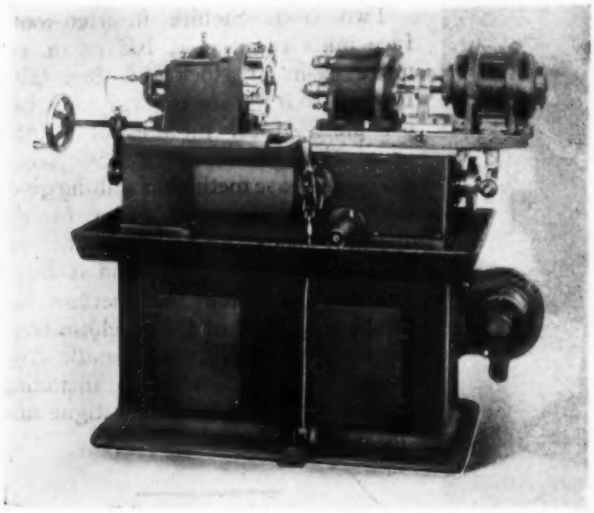
Cincinnati 18-Inch Duplex Miller equipped with an indexing base for milling three pads on a shock absorber body

Two 6-in. Stellite inserted-tooth face mills running at 103 r.p.m. remove $\frac{3}{32}$-in of stock. A fast table feed of 16.6 in. per min. gives a time per piece of 0.2 minutes or a total production per hour of 254 pieces. The index base method of milling gives almost continuous production for the operator loads the work on one end while that on the other end is being milled. In addition, the operator has complete control of the machine from the right-hand side. Automatic dog-controlled table movements, including intermittent feed, reduce fatigue and speed up production.

Langelier Semi-Automatic for Machining Watch Stems

The operations of turning, facing, spotting, drilling, and necking the stem winding post on wrist watch frames are performed on the machine illustrated. This unit has been developed by the Langelier Manufacturing Company, Providence, R. I. The output of the machine is 12 pieces per min. It can be operated continuously or tripped by the operator and stopped after each cycle.

In construction, the machine is of the horizontal lathe bed type, which sets into a pan bolted to the top of the cabinet base. A traversing saddle is mounted on the right end of the bed and gibbed thereto. It slides



A special, four-spindle, semi-automatic built by Langelier for machining the stem winding post on wrist watch frames

on a flat way at the front, and a V-way at the rear.

A housing carrying four horizontal operating spindles is bolted in a fixed position to the top of the saddle. The spindles are spaced equally on a 5½-in. circle, and run on ball bearings. They are driven by hardened spur gears by a central driving spindle, which is directly connected by a flexible coupling to a 1-hp. motor, also mounted on the saddle.

The first spindle is fitted with a two-cutter box tool, one cutter for turning the diameter of the watch case stem, and the other for facing the end. The second spindle is fitted with a starting drill, and the third with a drill for drilling the hole through the center of the stem. The fourth spindle is special in construction, and is used for turning a neck on the stem. All the tool holders and collets have fine threaded shanks.

The necking spindle has a central push rod, which operates the radial movement of the necking tool, the push rod being actuated by an edge cam on a cam shaft at the right-hand end of the machine. The saddle with the spindle housing and the motor as a unit is operated by a driven cam mounted on the cam shaft on the inside of the bed. This camshaft runs in bearings at each end, and is driven through a worm and wheel by a belt drive by a motor at the right-hand end of the bed. The worm wheel has a one-cycle clutch connection to the camshaft, which is connected to a hand starting lever at the front of the machine. A pedal is also provided for starting. In addition, a safety slip feature is provided on the worm wheel.

A five-fixture turret is attached to the flanged end of the turret shaft. The turret housing itself is adjustable in a gibbed slide.

The turret is indexed through a pair of spur gears and a geneva motion. It is locked in place at each indexing by a tapered spring plunger, actuated in turn by a lock control cam on the camshaft.

Floor space, 28x52-in.; weight approximately 2,000 pounds.

TRADE PUBLICATIONS

FURNACES, BOX. The Hevi Duty Electric Co., Milwaukee, Wis., has announced in a six-page bulletin No. 430, its 18 standard sizes of box type electric furnaces. The bulletin gives complete descriptions and specifications.

GASKETS, "METALLO." The Metallo Gasket Co., 10 to 18 Bethany St., New Brunswick, N. J., has issued Catalog 30 showing the various types of metallic-asbestos gaskets, and giving specifications for various standards of pipe flanges.

GRINDERS AND POLISHERS. Hammond Machinery Builders, Inc., formerly Hill-Curtis Co., Kalamazoo, Mich., has published a bulletin "Electric Grinders & Polishers" showing various models from small bench types to large snagging outfits, and giving the specifications and photographs. Various accessories are appended.

PRESSES, HYDRAULIC. The Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, has published a bulletin "H-P-M Hydro-Power Presses" giving the operating advantages, performance characteristics, construction specifications, sizes, and capacities. The bulletin is very well illustrated throughout and contains 16, 10½x8-in. pages.

STEELS, ALLOY. The International Nickel Co., Inc., 67 Wall St., New York, N. Y., has published a reprint of a paper by Charles McKnight giving a discussion of the available increase in strength with decrease of weight by the use of alloy steel for railroad forgings, castings, and boiler plates, together with other considerations.

BUYERS' GUIDE TO NEW ORLEANS. The New Orleans Association of Commerce, New Orleans, La., has published "Red Book of New Orleans Commerce," which is a classified directory of New Orleans business, listing conveniently the things made and sold, together with the grouping of local importers and exporters.

CYLINDER TESTING. The Robert W. Hunt Co., Engineers, 2200 Insurance Exchange, Chicago, Ill., has published a paper "Present State of Cylinder Testing," by Frank Eder.

ELECTRODEPOSITION OF METALS. The University of Illinois, Engineering Experiment Station, has issued bulletin No. 206 entitled "Studies in the Electrodeposition of Metals," which contains a study of the characteristics of electrodeposition of aluminum, beryllium, boron, chromium, tungsten, titanium, vanadium and cerium. Copies may be obtained for $0.10.

ENGINEERING COURSES, COOPERATIVE. The University of Cincinnati, Cincinnati, Ohio, has issued an announcement of cooperative courses in College of Engineering and Commerce for 1930-31. Another bulletin "The Co-operative System of Education" by Clyde W. Park is also available.

FATIGUE STRENGTH OF METALS. The University of Illinois, engineering experiment station, has published bulletin No. 205, entitled "A Study of the Ikeda Short-Time (Electrical Resistance) Test for Fatigue Strength of Metals." Copies may be obtained for $0.20.

HACKSAW BLADES. The U. S. Department of Commerce, Bureau of Standards, has issued Simplified Practice Recommendation R90-29, second edition, on "Hacksaw Blades." The bulletin is for sale by the Superintendent of Documents, Washington, D. C., at $0.10 a copy.

THE DARDELET THREAD. Columbia University, department of civil engineering, testing laboratories, New York, has published a "Report Upon the Comparative Shock Resistance of Standard V Thread and Nut Connections and Dardelet Thread and Nut Connections" made for Dardelet Threadlock Corp., 120 Broadway, New York City."

WORLD TRADE, 1929. The Foreign Commerce Dept., Chamber of Commerce of the United States, Washington, D. C., has issued "Our World Trade in 1929," giving the value and volume of principal exports and imports between United States and chief foreign markets.

NEWS
OF THE WEEK

What IS Ahead for Business— March Exports Better

By Paul Wooton
Washington Correspondent, American Machinist

WASHINGTON, D. C., May 7.—The keynote phrase, "What's ahead for business?" tinged the eighteenth annual meeting of the U. S. Chamber of Commerce with an air of concern. As compared with last year's event, much of the gala air had departed. Business men who gathered in Washington during the week of April 29 were ready to admit in less guarded terms than ever before that the time has come at least to think about the solution of crying problems. Three thousand strong they came from all branches of industry and all corners of the country. Outwardly they were the same solid citizens that flocked a year ago into the Chamber's fine marble temple to the glory of American business. They were shaved and ruddy, well dressed, and plentifully well fed as before, but the air of smug satisfaction was in some subtle way transformed. The chorus of amens was being said to a strikingly different sermon.

A greater disposition to view the evils and the responsibilities of the modern business structure was the real keynote. Last year when each delegate was glutted with swelling profits, it would have been heresy to suggest that business leadership could fail. This year, the same group was faced with the bitter fact that business leadership did fail.

There was some disposition to make a triumph over the fact that such leadership as there was saved the slump from going to rock bottom. This sort of moral victory did not seem to make a profound impression. Business Survey Conference, or no, it was plain that a preventable crash had occurred. This consciousness not only brought the Chamber delegates to think about means for preventing further crashes but put them in a frame of mind to hear other evil tidings about business.

After spending Monday in getting organized, the convention met en masse on Tuesday morning to hear William Butterworth, Chamber president, officially administer the keynote through the microphone. Aided by the spring sunlight which cast a rosy hue over the proceedings, his account of hard times was one of achievement and resistance to fate, rather than of failure.

United States export managers assembled at Washington for the annual meeting of the Chamber stressed three points in their discussions: 1. Greater attention must be devoted to advertising and developing foreign representatives with a sympathy for local conditions with which they combine a thorough knowledge of the manufacturers' production problems; 2. American branch plants abroad are one of the most effective means of holding a dominant position for the industries of the United States; 3. The 12-year-old Webb-Pomerene Law can now be worked to advantage in extending export associations, particularly for the small manufacturer.

Opening his speech before the Chamber of Commerce of the United States on May 1, President Hoover said:

"We have been passing through one of those great economic storms which periodically bring hardship and suffering upon our people. While the crash only took place six months ago, I am convinced we have now passed the worst and with continued unity of effort we shall rapidly recover.

"There is one certainty in the future of a people of the resources, intelligence and character of the people of the United States—that is prosperity."

One of the most effective presentations of foreign point-of-view came from Canadian Trade Representative Rawson who pointed to the new United States tariff as a barrier to nearly $75,000,000 in trade which last year came to this country. Counter-effective will be the British Commonwealth trade conference in London to encourage greater inter-empire trade. Commonwealth imports total $7,000,000,000 annually; nearly $4,000,000,000 can come from within the empire if properly organized.

An encouraging increase in exports of aircraft and parts for March, 1930, is shown in the report of the Department of Commerce. Although the valuation of all aeronautical exports is far below that for the corresponding month of 1929, an appreciable rise is seen in two of the three export classifications for March, 1930, as compared with February, 1930.

Twenty-seven airplanes, seaplanes, and other aircraft to a value of $425,688 were exported during March of this year, contrasted with 38 planes valued at $686,655 for the previous March. During February, 1930, 31 ships, worth $195,750, were exported. Figures for the three-month period ending March, 1930, run somewhat below those for the same period of 1929.

Aircraft parts and accessories, excepting tires, continued the increase, although failing to touch the high figure of March, 1929. An appraisal of $186,922 is noted for March of this year, as contrasted with $141,434 for February, 1930, and $322,091 for March, 1929. For the three-month period, 1930 is running slightly ahead of 1929. Engine exports increased 50 per cent during March.

An interesting sidelight on the concentration of industry is furnished as the by-product of a study made by the Census Bureau in planning how to attack the problem of releasing as promptly as possible the information produced by the new census of manufactures, particularly with respect to the materials used in industry. Practically all of the schedules covering the manufactures of food, textiles, forest products, paper, chemicals, rubber, leather, iron and steel, and machinery, carry a specific inquiry regarding the consumption of specified materials.

To hold up publication of this information until all the returns have been received and tabulated would entail long delay. To avoid this, Edward R. Dewey, specialist in charge of this feature of the census of manufactures, has made an analysis based on the 1919 census which reveals that 25 per cent of dollar volume of materials used in industry are consumed in 8 counties, located in 6 states, that, in order of importance are: Cook, Illinois; New York, N. Y.; Philadelphia, Pa.; Wayne, Michigan; Allegheny, Pa.; Kings, N. Y.; Cuyahoga, Ohio; and Hudson, N. J. The addition of 29 more counties from a total of 3,073 in the United States accounts for 50 per cent of the total consumption of materials used in industry. With 152 counties, 75 per cent is reached, and 399 counties represent 87½ per cent of industry's total consumption of materials.

On this showing, it is Mr. Dewey's intention to tabulate and release first the returns covering industrial consumption of materials in these areas during 1929.

The high points of the March machinery export figures, compared with those of March, 1929, and with those of February, 1930, are shown by the following concise tabulation:

	March, 1929	March, 1930	February, 1930
Electrical machinery and apparatus	$12,279,143	$11,320,646	$10,072,224
Industrial machinery	25,645,339	23,355,776	20,739,801
Power generating machinery	2,417,791	2,110,883	1,465,188
Construction and conveying machinery	2,303,954	2,912,296	2,099,446
Mining and pumping machinery	4,828,756	4,579,424	5,760,286
Power driven metal-working machinery	3,788,077	3,703,908	2,930,211
Other metal-working machinery	729,480	642,111	581,611
Textile machinery	1,640,541	931,466	715,624
Sewing machines	1,050,970	686,534	736,278
Shoe machinery	206,375	144,627	138,146
Other industrial machinery	8,428,657	7,508,310	6,166,894

Items of electrical machinery and apparatus showing important increases over March of last year were: motors over 200 hp.; electric locomotives; electric furnaces; warehouse motor trucks; telephone switchboards; other telephone equipment. Some of the decreases were in the following items: direct current generators; steam turbine generator sets; portable electric tools; household refrigerators and washing machines.

Under industrial machinery the principal increases in March were: locomotives; Diesel and semi-Diesel marine engines, and water turbines. Decreases included the following: locomotive parts; other engine parts; steam boilers, internal combustion engines; Diesel and semi-Diesel engines.

A number of items under the heading "power-driven metal-working machinery" showed sharp upturns. They were: knee-and-column type milling machines; radial drilling machines; drilling machines other than vertical surface grinding machines; internal grinding machines, sheet and plate metal-working machinery; foundry and molding equipment. The detailed figures under this heading follow:

	March, 1929	March, 1930	February, 1930
Engine lathes	$247,094	$227,109	$209 961
Turret lathes	228,767	179,958	111 568
Other lathes	244,872	109,060	100,151
Vertical boring mills and chucking machines	80,361	74,002	58,661
Thread cutting and automatic screw machines	111,019	116,762	105,254
Knee and column type milling machines	136,602	88,640	57,456
Other milling machines	172,328	131,611	76,514
Gear cutting machinery	142,640	54,208	94,532
Vertical drilling machines	77,151	34,390	96,814
Radial drilling machines	46,475	81,357	20,950
Other drilling machines	52,134	143,864	229,197
Planers and shapers	87,006	213,116	30,911
Surface grinding machines	26,947	54,386	51,758
External cylindrical grinding machines	216,050	165,180	76,020
Internal grinding machines	125,720	169,832	200,507
Tool grinding, cutter grinding and universal grinding machines	63,516	70,938	70,350
Other metal grinding machines	84,980	117,169	62,676
Sheet and plate metal-working machines	351,931	605,124	251,029
Forging machinery	206,077	159,053	159,617
Rolling mill machinery	296,424	118,960	29,202
Foundry and molding equipment	181,153	243,555	364,684
Other power driven metal-working machinery and parts	608,830	545,634	471,399
Pneumatic portable tools	224,780	135,230	131,708
Other portable and hand or foot operated metal-working machines and parts	110,779	88,582	81,520
Chucks for machine tools	24,533	26,493	32,197
Drills and reamers	89,177	90,960	69,745
Pipe stocks, pipe dies and pipe cutters	53,813	124,508	77,040
Other thread cutter die stocks, screw plates, taps and dies	120,554	88,330	66,773
Other metal-working machine tools	105,844	88,008	122,628

* * * *

B. F. Waterman Heads Gear Makers' Group

B. F. Waterman of the Brown & Sharpe Manufacturing Company, was elected president of the American Gear Manufacturers' Association at the 14th annual meeting in Cincinnati from May 1-3. E. W. Miller, Fellows Gear Shaper Company, was named first vice-president and John Christianson, Cincinnati Gear Company, second vice-president. Warren G. Jones, of the W. A. Jones Foundry & Machine company, was re-elected treasurer and Thomas W. Owen secretary.

* * *

Iron Casting Production Shows Increase in March

One hundred and forty-two foundries reported a production of 28,386 tons of castings during March. Production during the month as related to normal production shows a percentage of 92.8. Production during February was 85.5 per cent and March of one year ago was 135.4 per cent. New business received during the month for 76 foundries indicated a percentage of 78 per cent, as compared with 98.2 per cent for February and 135.5 for March of 1929. Unfilled orders at the close of the month for 76 foundries equals 55.9 per cent, as compared with 70 per cent for February and 118.1 for March of one year ago.

* * *

Foreign Traders Revise Program

The revised program for the 17th National Foreign Trade Convention, to be held from May 21 to 23 at the Hotel Biltmore, Los Angeles, has just been announced. The first general session will open on the morning of May 21, with a call to order by James A. Farrell, chairman. Mr. Farrell will also present an address on the title "The World Trade Outlook."

Edward N. Hurley, chairman of the board of the Hurley Machine Co., Chicago, and president of the American Manufacturers Export Association, will present a paper entitled "Co-operation in Foreign Trade" on the afternoon of Thursday, May 22.

* * *

Lay-Off Prevention Made Board Study

To discharge employees indiscriminately, when circumstances seem to require a reduction of the working force, is no longer the general policy of American industry. It has been largely superseded by the search for methods to stabilize employment, according to a study entitled "Lay-Off and Its Prevention," just made public by the National Industrial Conference Board, 247 Park Ave., New York. That fluctuation in a working force causes expense is increasingly realized by employers and has led them to a new attitude toward lay-off, which has come to be regarded as a last resort. Uneven operation preventing plants from utilizing their full productive capacities, causing loss of the special skill of those who are laid off, and adding the cost of training new employees, runs up a bill of striking proportions. More than half of the companies reporting their procedure to the board named seasonal fluctuation as the chief cause for lay-offs.

* * *

Sharpe Defends Machines In Round Table Talk

Speaking in a round table business conference between five of America's industrial and business leaders broadcast over an NBC network on April 27, Henry D. Sharpe, president of the Brown & Sharpe Manufacturing Co., Providence, R. I., said: "As a result of machines men are able to do more, to earn more, and as a result, to have more things than ever before.

"We hear a lot of loose talk, and looser writing, about machines displacing labor," he said, "But, in my lifetime, I have seen machines give employment to millions of men in industries that did not even exist in my father's time."

* * *

Variety of Subjects on Management Program

A wide variety of subjects are included in the program just announced for the Annual Spring Convention of the American Management Association, to be held from May 12 to 14, at the Hotel Astor in New York City. Among those announced are: Organization and Operating Principles; Organization of the Managing Group; Principles of Incentive for Executives; How to Prevent the Failure of Mergers and How to Make Them Pay; Management Developments in Western Electric Company; Industry's Public Relations, and Fundamentals of Company Publicity. An international dinner on Management and

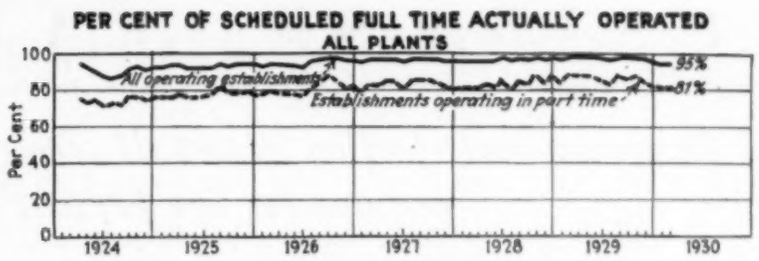
International Prosperity will also be held as part of the program.

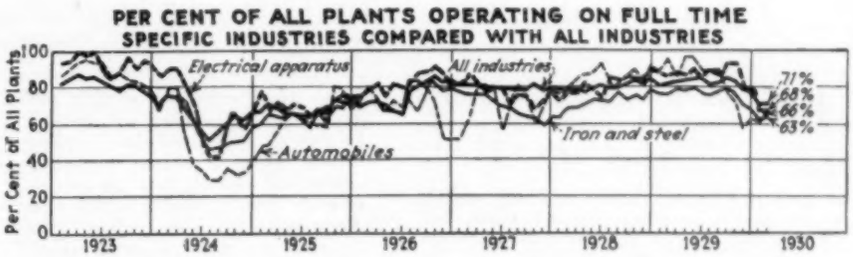
The paper on "Organization and Operating Principles" will be presented by Edgar W. Smith, assistant to the president of the Export Division of the General Motors Corporation. Other metal-working executive who will take part in the program are: S. R. Rectanus, vice-president of The American Rolling Mill Co., Fowler Manning, president and general manager of the L. C. Smith & Corona Typewriters, Inc., A. D. Walter, vice-president of the Ohio Electric Manufacturing Co., C. G. Stoll, vice-president in charge of operations, Western Electric Co., C. A. Purdy, development engineer, Western Electric Co., and several others.

* * *

Westinghouse Holds Organization Meeting

At a meeting of the board of directors of the Westinghouse Electric & Manufacturing Co. for organization, held in New York recently, the following were elected officers for the ensuing year: A. W. Robertson, chairman of the board; E. M. Herr, vice-chairman; F. A. Merrick, president; vice-presidents: L. A. Osborne, Charles A. Terry, H. P. Davis, H. D. Shute, H. T. Herr, Walter Cary, W. S. Rugg, James C. Bennett, T. P. Gaylord, Harold Smith, J. S. Tritle, W. K. Dunlap (Acting), S. L. Nicholson (Acting).





Plant Operation Shows Little Decline Despite Present Slowness

THE accompanying chart shows for upwards of ten thousand representative manufacturing plants in the United States the percentage of schedule time actually operated, and for selected industries, the percentage of the whole number of plants operating on full schedule time. This chart has just been compiled by the National Industrial Conference Board, and is taken from statistics from the U. S. Bureau of Labor.

The closing down of plants for a portion of the scheduled time is in some instances due to technical emergencies, such as failure of motive power or the need for extensive repair. In general, however, such curtailment of the usual hours of work is a device by means of which production is adjusted to a slackened demand for the product. What may, therefore, be designated as "under employment" is a frequent evidence of business depression. During the period shown on the chart there were comparatively few months in which more than 80 per cent of all the plants operated on full time. Of the remainder, a few, rarely exceeding 2 per cent, were idle while the others were operating on a shortened schedule. Judged by the number of plants, full-time operation from 1924 to the middle of 1926 and at the beginning of 1930 was noticeably less than in the intervening period. The industrial groups, resting upon a large number of establishments, and exposed to varied and sometimes compensating influences in the different branches of industry within the group, show in the chart less variation than is seen in the lines representing individual industries.

A comparison of the basis of the time schedule rather than the number of plants shows that the deviation from schedule time for all plants taken together is comparatively slight. Even in those plants which operated on part time, the curtailment is only in rare cases in excess of one day in a week of 48 hours. Until the latter part of 1929, somewhat steadier operation occurred in the later years of the period.

The term "Plants Operating on Part Time Schedule" means those plants working any time short of full time, but not entirely idle during the month. The term "Plants Operating on Full Time Schedule" means the number of plants working normal schedule of hours, whatever such regular schedule may be.

It looks like a welder in a huge crystal ball, but he is really welding a seam inside a large oil circuit breaker tank at the General Electric plant

BUSINESS · BAROMETER

Congressional election next fall seems to be one of the major reasons for the present quietude

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

THE stock market is plainly fatigued. The efforts that were made to resuscitate the boom that collapsed last November have not been successful. Of course, it was not hoped to bring about a revival of the ecstasy which pervaded all America during the summer of 1929, but a resuscitation of investment demand was hoped for, and that hope was the cornerstone of the recovery that was brought about early in the year.

The reasons for the reaction that set in a few days ago are known to everyone who has had occasion to observe the evolution and devolution of the most remarkable boom the American stock market has ever experienced.

The advance in prices as well as the decline which ensued were largely psychological. The country became the victim of its own enthusiasm over American prosperity, and proceeded to discount the expansion of years. Now it must wait for the growth upon which it counted, and even in America growth is a process which requires time. However, the rapidity with which we sometimes grow is amazing, and it is quite possible that the garden of American hope will fructify with greater promptitude than it has in the past.

The reasons for this possibility are psychical as well as physical. Self-confidence is often the handmaid of rapid development. This has been peculiarly true of America, as shown by our marvelous expansion during the post-war period. Then there is the physical side of it. Some new scientific discovery or some labor-saving machine by which cost may be lessened or production increased is announced almost every day.

In the aggregate these discoveries constitute a force which greatly accelerates our material development and our gain in wealth. So there is but little reason for us to worry about the future. We may have a temporary set-back. One is really overdue, but it will be only temporary, and a year from now it will probably be forgotten.

If one were forced to give a reason for the present quietude he would probably specify the Congressional elections which will be held next autumn. There is no doubt that they have caused apprehension in the minds of some and that a partial political turnover is now expected.

Under such conditions business generally slows down, and in this respect at least history promises to repeat itself during the summer and early autumn.

General trade is about normal. Staple merchandise seems to be passing into consumption at close to the usual rate. Automobiles in the middle and higher price ranges are hard to sell, but the demand for cheaper machines is well sustained and production holds the gains made during the first quarter.

The steel industry is losing ground a little and weakness in prices is evidence that it cannot sell its present production. In building the high level of utility and public works construction shows an endeavor to keep business steady, but it does not wholly make up for the decline in residential building.

Business in copper has been somewhat stimulated at the decline, but it can hardly be regarded as symptomatic as the copper market is notoriously under control. There is a seeming lack of confidence that even the 14-cent price can be maintained.

There is an acute depression in the cotton textile industry, especially in New England, but prices for standard goods are now so low that many merchants are commencing to anticipate their requirements by purchases which will carry them well into the autumn. To this statement the chain stores are, however, an exception, as they appear to be indissolubly wedded to the hand-to-mouth policy. This hand-to-mouth policy is in fact one of the perplexing features of the situation.

Raw cotton is *in statu quo*. It is sustained by the attitude of the United States Government, and by what little is known of its policy in the respect of the cotton that has been bought and paid for through the Co-operative Associations. Other commodities besides cotton show but little change. Most of them are subnormally low and many of them offer speculative opportunities that are certain to be taken advantage of sooner or latter. In most cases the position as revealed by the available statistics is very bearish but there are "invisibles" which the statistics do not cover, and at a certain price level a surplus always ceases to be depressing.

Both the Bank of England and the New York Federal Reserve Bank have cut their rediscount rates to 3 per cent, and the Bank of France has established a 2½ per cent rate. If easy money has the power to stimulate business this ought to accomplish it, though it is equally true that such easy money could not be had if business activity were not less than normal.

It is yet too early to make any predictions with regard to the crops of 1930, but we ought to be prosperous if our agricultural yield is a fair one and if reasonably good prices can be realized for it.

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From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

SENSITIVENESS reflecting the general business atmosphere is characterizing machinery and machine-tool markets throughout the country. Districts reporting good business one week report spotty conditions or a falling off the next. So it goes, with opinion placing the upturn in midsummer. With the situation as it is, one guess is as good as another. Inquiries are beginning to show signs of slackening, but this creates no worry, since the volume of inquiries received since the first of the year is sufficient to keep the market active if a few of them could be changed into orders.

NEW ENGLAND business has fallen off, both in new-tool and used-tool sales. Detroit reports the market spotty, with the latter part of April showing a tapering off. Chicago, on the contrary, shows improved conditions, with railroads and domestic equipment manufacturers in the market. Philadelphia inquirers are the railroads and industrial interests, although business there was rather slow last week.

INDIANAPOLIS reports a spotty market with some indications of improvement on the way. Demand there is not from metal-working plants. Milwaukee considers the market decidedly favorable, with automobile builders there showing interest. Cincinnati reports no change. New York's market is still slow, the week's business being good for but one or two firms.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

A level of new business in machine tools that continues below expectations is the feature of New England market activities. The current week's buying was of the hand-to-mouth variety and orders were almost entirely for single machines. Inquiries again resumed prospective promise far above the level of actual new business placed.

Industrial conditions displayed a jump in activity in several industrial centers. Ball bearing manufacturers and branches of the electrical industry showed increased schedules. Small shops engaged in contract work are fairly busy.

From reports used-equipment dealers are doing a fluctuating business. Sales resistance in most quarters is strong despite a better list of good-condition machines than has been evident for some time. In this section but few concerns will show a better volume of sales for April than was compiled in March.

DETROIT

The machinery and machine-tool market in the Detroit area has been extremely spotty for several weeks and is now at a lower general level than it was during the early part of April. As a whole, the month of April was more profitable than March, but the latter one-third showed a distinct tapering off, a condition which has not yet begun to adjust itself.

Dealers here report a fair average of general replacement business with few large sales and few inquiries that give promise of significant orders in the immediate future. The tone of the market is distinctly unfavorable in spite of the apparent prospects for increased production in the automotive industries. The market has been sensitive and unstable for most of the past three months and it does not seem to be improving in character.

Automobile manufacturers are more optimistic than they have been at any time this year, probably due to the coming of warm weather. The small contract jobbers are doing more business for the automobile plants than they had been doing earlier in the year but this has not caused them to buy any great amount of tools or equipment.

It is generally believed that June and July will witness a substantial industrial advancement with an accompanying improvement of the machinery and machine-tool trade.

CHICAGO

With but few exceptions, reports from machine-tool builders' representatives and distributors on April business tell of an increase in sales over March. In one instance, an executive of one of the leading machine-tool companies informed the writer that more business was done by his concern during last month than in any April since the war. He explained this by saying that his house was exceptionally fortunate in securing the major part of an order for the equipment of a large, new manufacturing plant. Railroad inquiries continue to be received. The Northwestern, the Milwaukee, and the Rock Island roads are in the market for several units not included in former lists. The feature of the week seems to have centered about the buying program of the Grigsby-Grunow Co. for its new plant to manufacture refrigerators for domestic use. On what is considered good authority it is declared that the figure set by this company as necessary to completely equip its plant will not fall short of $3,000,000, a large part of which already has been contracted for. General industrial demand shows little improvement, being largely limited to single tools and small lots. There is no noticeable change for the better in the trend of the used-tool market.

PHILADELPHIA

Sales of machinery and machine tools fell off in the Philadelphia market during April as compared to the corresponding month of last year. There was little activity during the last two weeks, and dealers and sales agents are now placing the period of resumption of business at June 1.

Not only were sales off during the fortnight, but inquiries were retarded and there was a general lack of buoyancy. What few inquiries came through have not yet given indication of bearing substantial sales.

Among the inquirers were the Missouri Pacific and the Northern Pacific Railroads, which have sought information concerning prices and deliveries through sales agents. Several industrial establishments in the Eastern section have obtained quotations from some of the larger dealers, and some inquiries have come from shipbuilding companies along the Eastern seaboard, from which some orders may reasonably be expected.

There also were some inquiries for industrial equipment from the Eastern territory, with lathes, shapers, duplex drills, planers, and millers being in the list of those inquired about.

Leaders of the industry do not anticipate resumption of any substantial buying until midsummer.

INDIANAPOLIS

While the machinery and machine-tool business in this city remains somewhat spotted, there are indications of improvement in some lines. Dealers and manufacturers here say one of the chief troubles is that some weeks will be very light and other weeks will show a normal volume and many times more than a normal volume. The makers of special machinery for furniture factories and other woodworking plants report a fair business. This is particularly true with those selling to flooring factories, where there has been some replacements, though no enlargements to speak of.

Some really good business has been done this year with the brick-making plants, particularly those making face brick and conduits. In most cases, the new equipment replaced some obsolete equipment that should have been discarded long ago. Much the same is true of the stone trade.

The steel trade is not buying in the large quantities that had been expected. However, it is doubtful if the dealers expected the volume they claimed was probable at the beginning of the year. The structural steel plants are the ones that are causing the most disappointment.

Demand from the automobile trade, while picking up during the past month, shows plainly it will not set any records.

MILWAUKEE

Although the demand for metal-working equipment has not yet regained its accustomed freedom of movement, there is evidence on every hand that the recent improvement in business is being well maintained and progress is being made. A noticeable feature of tool trade in recent weeks is that the demand is slowly moving beyond a point of merely supplying necessary replacements, and that a steadily increasing number of buyers are in the market for equipment to extent capacity. This is particularly true of the Milwaukee market. Few districts have shown a comparable degree of buying activity, or more promising prospects for future business.

It is considered significant of definite improvement that more of the automobile factories are inclined to act upon inquiries put out in recent months. While new business from this source has been disappointingly light, recent betterment in retail sales doubtless will have an early effect on production schedules.

CINCINNATI

A very slight increase in sales was reported by a few of the machine-tool manufacturers of the Cincinnati district during the week. With the great majority, business was dull, with no material change from the previous week.

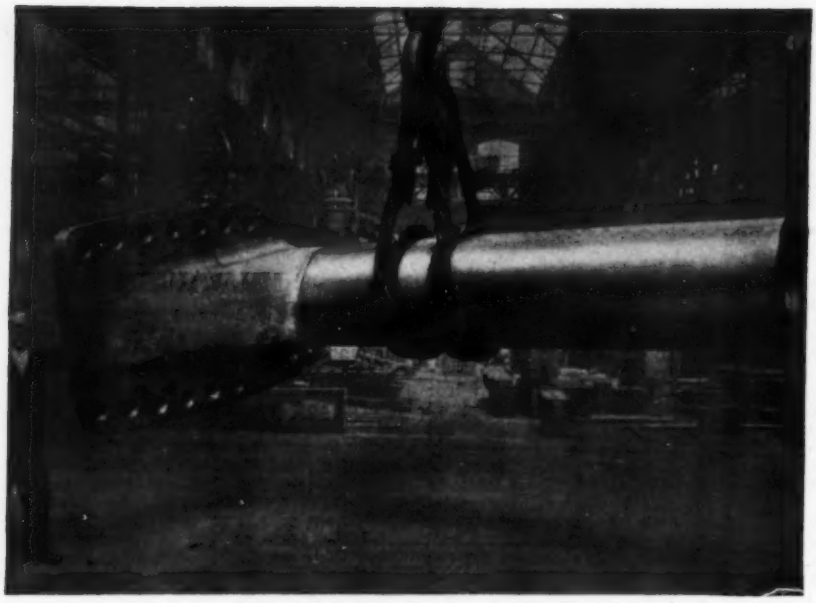
Here and there was an order for two or three items, but the great majority of the orders were for single tools and replacements. The business was well scattered geographically and well diversified as to sizes and types of requirements, the greater part of the orders coming from general machinists and miscellaneous industrial users.

The week's inquiries were numerous, well diversified, and well scattered. The great majority of these were from general machinists and miscellaneous users, whose requirements were single tools and replacements. Several foreign inquiries were received, these being from Germany, Italy, Russia, and South America.

Selling agents report that their business was at about the same level as it has been for several weeks past. Orders received in the week from concerns in local and adjacent territory were largely confined to single tools and replacements, but the aggregate was fairly satisfactory, considering the state of the market.

NEW YORK

The New York machinery and machine-tool market is rather uniformly quiet, with only an occasional dealer who had a good week's business. One or two dealers report an exceptional week, considering the quietness of business. One reports sales of several large items including a radial drill. An inquiry of importance come from the U. S. Navy for a list of tools for the West Coast, among them several lathes, a boring machine, and a miller. The New York Central has also inquired for a lathe or two. The remainder of the inquiries are in decreased volume, but come from a wide variety of fields. They are mainly for single items for replacement, but would total a good aggregate if they could be closed. Most dealers expect little change in the situation before mid-summer and an accompanying improvement in general business condition. Export business continues good, but in slightly decreased volume, and the used-tool market shares the condition of its new-tool counterpart.



The 32,700-lb. rudder shaft forging for the S.S. Europa. The Europa's machine shop will be described in next week's American Machinist

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Business Items

At the annual stockholders meeting of The Timken Roller Bearing Co. on April 15, directors elected were: H. H. Timken, J. G. Obermier, M. T. Lothrop, J. W. Spray, Henry H. Timken, Jr., of Canton; W. R. Timken of New York, and A. C. Ernst of Cleveland. Officers elected at the directors meeting were: H. H. Timken, chairman; M. T. Lothrop, president; W. R. Timken, J. G. Obermier, J. W. Spray, H. J. Porter, T. V. Buckwalter, L. M. Klinedinst, vice-presidents; R. C. Brower, secretary-treasurer; J. A. Riley, assistant treasurer; F. F. Tudor, assistant secretary.

A $250,000 expansion program which includes the extension of the present factory and office buildings and the purchase and remodeling of 5 acres of adjoining property has recently been announced by Frank H. Adams, vice-president and general manager of the Surface Combustion Co., Inc., 2375 Dorr St., Toledo, Ohio.

The Champion Hose Coupling Co., Inc., recently leased 37,000 sq.ft. of floor space at 4053 Hollis St., Oakland, Calif. The plant is expected to be in production within the next two months. Products will be distributed in California under the trade name "Champion." H. C. Piper is the general manager, and F. F. Durant, sales manager.

The William F. Klemp Co., 3341 South Western Ave., Chicago, has completed the purchase of a plant location at Melvina Avenue and Sixty-Sixth Place in the Clearing, Ill., industrial district. The site has a plant building containing 12,000 ft. of working space. The company owns an additional 20,000 sq.ft. of ground at the location.

The Chain Belt Co., Milwaukee, has recently appointed two distributors in the construction equipment division. The R. B. Everett Co., Houston, Texas, will be distributor in the Texas district and the J. D. Adams Manufacturing Co., Indianapolis, Ind., will act as distributor in the Indianapolis territory.

The Southern Bearings & Parts Co., distributor for Fafnir bearings in Birmingham, Ala., has now undertaken the distribution of Fafnir transmission equipment, succeeding the Moore-Handley Hardware Co., according to announcement by officials of the Fafnir Bearing Co., New Britain, Connecticut.

The Racine (Wis.) Tool & Machine Co., has acquired a factory building which approximately triples the space available for manufacturing. M. E. Erskine is president. William Reindhardt is superintendent, and J. S. Toohey and P. F. Ott are in charge of the engineering and experimental departments.

E. C. Atkins & Co., Hamilton, Ont., are opening a branch office at 76 Nelson St., Toronto.

The Western Engineering Co., Ltd., has been incorporated by Dominion charter with head office at Winnipeg, Manitoba. The company intends to carry on a mechanical, electric, and hydraulic engineering business.

The Herberts Machinery & Supply Co., Los Angeles, was recently reincorporated as the Herberts Machinery Co., Ltd. The company was started by C. A. Herberts, now president, in 1915. S. W. Clawson is secretary; D. N. Macconel, vice-president and sales manager, and N. Troop, treasurer.

The Linde Air Products Co. and associated companies will have a display at the Annual Convention and Exhibit of the American Foundrymen's Association, at the Public Auditorium, Cleveland, from May 12 to 16. The Linde display will place emphasis on the various applications of the oxy-acetylene process in modern foundry practice.

The Florida Machinery & Equipment Co. has removed its entire plant, warehouse, and equipment from Lakeland, Fla., to Tampa, Fla., and is occupying the brick building formerly housing the Perry Paint & Glass Co. on East Lafayette St. Edward Tauverman is president.

John B. Stevens Inc., formerly at 27 Cleveland Place, New York, N. Y., has moved to 304 Hudson St. Repairs and replacements can be had at this address for approximately 75 per cent of the lines formerly made by the Garvin Machine Company.

The Buckeye Portable Tool Co., Dayton, Ohio, will exhibit several new air tools in addition to the standard line at both the American Foundrymen's convention in Cleveland beginning May 12 and the mechanical division of the A.R.A. meeting to be held at Atlantic City, June 18.

A corps of engineers from the main offices of the Wabash railroad in St. Louis are surveying land at the east edge of Peru, Ind., preparing plans and specifications for new yards and the erection of shops on the site during the summer.

The Newman Tool & Die Works, Oakland, Calif., is manufacturing an air brake of new design for use on automobiles and trucks.

The General Electric Co. is to remove its radio department at Pittsfield, Mass., to the Camden, N. J., plant. Machinery and equipment is being put into condition for removal.

The Enterprise Iron Works, Oakland, Calif., has leased 7,200 sq.ft. of floor space and will engage in the manufacture and fabrication of structural steel and specialize on small buildings such as service stations. W. J. Patterson and H. E. Richardson are co-owners.

The Victory Engineering & Sales Co., 5259 Western Ave., Detroit, has been formed to handle engineering, processing, designing, and sales for the Victory Machine & Tool Co., Detroit. Ed. L. Greer, formerly with Kraetke Bros., will head the organization.

Announcement has been made by the Norwood Engineering Co. of Canada, Ltd., Montreal, that arrangement has been made with McKinely & Norwood, Ltd., Ottawa, Ontario, to act as representatives in the province of Ontario.

The Chain Belt Co., Milwaukee, has moved its New York office into new quarters in the Chrysler Bldg., 405 Lexington Ave. For a number of years their New York office was located at 50 Church St. W. H. Quinn is New York district manager.

Group Parts, Inc., 222 Harrison St., Syracuse, N. Y., has been appointed distributor of Fafnir products in that terri-

tory, according to announcement by the Fafnir Bearing Co., New Britain, Conn.

It has been decided by the management of the Steel Trough & Machine Co., Ltd., Tweed, Ontario, to change the name of the company to Gordon Steel Works, Ltd., under which name they will henceforth operate.

Bullard-Davis, Inc. (of California) has resumed its former name of the E. D. Bullard Co. The company also has announced the purchase of the First Aid Equipment & Supply Co., Los Angeles.

The Vulcan Engineering Works, Ltd., Vancouver, has purchased the plant of the Vulcan Iron Works, Ltd., for an amount reported to be about $500,000.

B. F. Perkins & Sons, Inc., Holyoke, Mass., has acquired the business of the Vacuum Valve Cap Co., Springfield, Mass. Alexander Campbell, president and treasurer of the latter company, will have charge of production.

The Reynolds Metal Co., New York, controlled by the United States Foil Co. Inc., has acquired the Midland Metals Co., Chicago, which will be called the Midland Foil Co., and operated as a division of Reynolds Metals.

The Viking Pump Co., Cedar Falls, Iowa, has started work upon a $20,000 addition, 58x122 ft., to its plant. Work will be completed by the first of June. It will be a 2-story brick, fireproof, structure.

The Air-Land Manufacturing Co., Ltd., Vancouver, recently organized by W. E. Anderson, formerly of Hayes-Anderson Co., Ltd., is erecting a plant in Vancouver for the assembly of flying boats.

The Canadian Bridge Co. Ltd., Walkerville, Ont., is building a new shop for the fabrication of steel transmission towers.

The Chicago branch sales office and warehouse of The Bunting Brass & Bronze Co., Toledo, Ohio, has been relocated at 1221 West Washington Boulevard, Chicago, removing there from South Michigan Avenue.

The Automobile Transport Corporation, Detroit, has been incorporated with $200,000 capital to manufacture and deal in tractors, trailers, and equipment.

The Carter Radio Co. Ltd., and the Utah Products Co., have leased manufacturing space in Toronto, Ont. They are both branches of Chicago firms.

The Bur-Hi Artcraft Corporation, Middleton, Wis., has acquired the entire property of the Better Products Co., Columbus, Ohio.

The Square Stamping Co., Trenton, N. J., has been incorporated to stamp sheet metal.

Homer Strong & Co., Inc., Rochester and Buffalo, N. Y., have been appointed exclusive representatives for the Federal Press Co., Elkhart, Ind., in the Rochester and Buffalo territories.

The Ransom Manufacturing Co., Oshkosh, Wis., has changed its name to the Ransom Grinding Machine Co. The organization will remain the same as heretofore.

The Issodun Aircraft Manufacturing Co., Detroit, has been incorporated with $500,000 capital to manufacture an amphibian airplane.

The Stetson-Ross Machine Co., Seattle, Wash., has been reorganized and has been taken over by lumber interests scattered throughout the West.

J. I. Bernitz, import and export manufacturers' agent at 25 Beaver St., New York, N. Y., has changed his address to 47-49 West St., New York.

Personals

E. A. DOYLE, consulting engineer, Linde Air Products Corporation, New York, has been elected president of the American Welding Society. E. P. MCKIBBEN, consulting engineer of the General Electric Co., at Black Gap, Pa., has been elected senior vice-president. C. W. BABCOCK of the Westinghouse Electric & Manufacturing Co., Boston, was elected vice-president for the New York-New England division; W. W. BARNES, Air Reduction Sales Co., Philadelphia, vice-president for the Middle Eastern division; H. A. WOOFTER, Swift Electric Welder Co., Detroit, vice-president for the Middle Western division. Directors are: J. J. CROWE, Air Reduction Sales Co., New York; W. H. GIBB, Thomson-Gibb Electric Welder Co., Bay City, Mich.; H. S. SMITH, Prest-O-Lite Co., New York, and W. C. SWIFT, American Brass Co., West Alexandria, Ohio.

JOHN C. ARDAGH has been transferred to the Welding Service Division of the Lincoln Electric Co., Cleveland, Ohio, and has been placed in the Chicago district with headquarters in the Monadnock Bldg. R. A. KYLE has been transferred to the same division with headquarters in the New York district at 136 Liberty Street. ROBERT NEWTON has been transferred to the welding service division of the Cleveland district with headquarters at the factory.

GEORGE A. ARMES, president of the General Engineering & Drydock Co., San Francisco, was recently elected president of the Los Angeles Shipbuilding Drydock Corporation. Mr. Armes' election to the presidency indicates that the Los Angeles concern has been taken over by the General Engineering company, although the two plants will continue to be operated as separate units.

FRED W. AYERS has been named general manager of the Moon Motor Car Co. He was formerly an operating executive of the Oakland-Pontiac organization.

MAX W. BABB, vice-president of the Allis-Chalmers Manufacturing Co., Milwaukee, has been appointed a director of the Federal Reserve bank for the Seventh district, Chicago, to serve the unexpired term of the late Augustus H. Vogel of Milwaukee.

R. M. BLAKELOCK of the General Electric Co., Schenectady, presented a paper on "Micromotion and Its Application to Manufacturing Problems" before the Metropolitan Section of the A.S.M.E. on April 17. DR. LILLIAN M. GILBRETH was the presiding officer.

JOHN BODE, former engineer for the Mackintosh-Hemphill Co., Pittsburgh, and more recently identified with the Wellman Engineering Co., Cleveland, is now affiliated with the sales department of the Aetna-Standard Engineering Co., Youngstown, Ohio.

C. R. BROWN, formerly assistant manager of the Dallas, Texas, office of the American Cast Iron Pipe Co., Birmingham, Ala., has been made manager of the Detroit office to succeed F. W. MCMEANS, resigned.

RALPH BUDD, president of the Great Northern Railroad, will sail on June 1 for Russia, where he will act as adviser to the Russian Soviet Government on the rebuilding of its railroad system along the lines of American railroad standards and practices. He expects to spend three months there.

AVERY D. BYLER, vice-president and general manager of the Edison General Electric Appliance Corporation, Chicago, has been elected chairman of the Walker Dishwasher Corporation, Syracuse, N. Y., recently acquired by General Electric.

M. L. CARR, formerly identified with Barrington Associates of New York City, has been appointed staff engineer of the Pittsburgh Testing Laboratory, Pittsburgh, to act as consultant in purchasing, production, and sales problems.

F. W. CASE was recently appointed Los Angeles district manager in charge of sales and service for the Bristol Co., Waterbury, Conn., and W. H. RODGERS was made sales and service engineer at Los Angeles.

GEORGE CASTOR, formerly vice-president of the Donaldson Iron Co., Emaus, Pa., has been elected president to succeed J. T. EBERLEIN, resigned, who was connected with the company for 46 years.

R. L. CAWOOD, president of the Patterson Foundry & Machine Co., and the Patterson Steel Products Co., East Liverpool, Ohio, has announced a new mechanical training course which is to be put into effect at once. The course is open to young men of 18 years of age or over having a high school education or equivalent and coming from East Liverpool and neighboring towns. The training course takes two years and nine months to complete and will fit the man for either a professional or a trade position.

E. A. CLARK, sales engineer of the Philadelphia Office of the Reliance Electric & Engineering Co., has been

advanced to the engineering department in Cleveland where he will be engaged in the design of d.c. motors.

F. C. COBURN, member of the firm of Sanderson & Porter, has been elected president of the Aviation Corporation of Delaware, to succeed GRAHAM B. GROSVENOR, who has become vice-chairman of the board of directors.

J. E. CONROY, formerly with the Standard Horseshoe Co., has been made general manager of sales of the Tremont Nail Co., Wareham, Mass., under the direction of J. S. KENYON, Providence, R. I., president.

A. C. DICKINSON, president of the Sikorsky Aviation Corporation, New York, has been elected chairman of the board of directors, according to a recent announcement by F. B. RENTSCHLER, president of United Aircraft & Transport, Inc., of which Sikorsky is a division. Mr. Dickinson's place as president has been taken by E. E. WILSON, president of the Hamilton Standard Propeller Co., Pittsburgh, another unit in the United group. Mr. Wilson, who retired last year as a commander in the navy, will continue as president of the propeller company.

SLOAN HESS, formerly with H. W. Petrie, Ltd., Toronto, Ont., has become sales manager of The International Machinery & Supply Co., Hamilton, Ontario.

G. L. DRAFFAN has been elected secretary of the Ohio Brass Co., Mansfield, Ohio. W. A. SPRINGER, assistant treasurer, was elected treasurer, and J. M. STRICKLER, formerly assistant sales manager, has been appointed general manager of sales.

L. A. GERBER, former western district sales manager for the U. S. Chain & Forging Co., Pittsburgh, has been made general sales manager. W. L. REILLY, who has been in the Pittsburgh office for the last ten years, has been made assistant general sales manager. L. K. ROBINSON has been appointed eastern district sales manager with headquarters at 1610 Woolworth Bldg., New York City. HARLEY MORRIS has become western district sales manager with offices at 1604 Conway Bldg., Chicago.

F. J. GRIFFITHS, formerly chairman of the Central Alloy Steel Corporation, Massillon, Ohio, now a part of the Republic Steel Corporation, Youngstown, is president of the Republic Research Corporation, Massillon, recently incorporated at Columbus, Ohio.

RUSSELL F. HARDY, chief engineer of the Waco Aircraft Co., Troy, Ohio, will present a paper entitled "Design of Airplane from the Point of View of Cheap Production" at the Dayton Aeronautic Meeting of the A.S.M.E., from May 19 to 22.

WALTER HARNISCHFEGER, vice-president of the Harnischfeger Corporation, Milwaukee, and its subsidiary, the Milwaukee Electric Crane & Hoist Corporation, has returned from a three-months' trip to continental Europe in connection with the export business of the company.

R. J. HARRY, assistant superintendent of the electrical department of the Carnegie Steel Co., Homestead, Pa., has resigned to become general sales engineer for the Alliance (Ohio) Machine Company.

L. W. HAYDEN has been appointed resident engineer of the Hevi Duty Electric Co., Milwaukee, with headquarters in Philadelphia. He was formerly an engineer affiliated with the Western Cartridge Co., East Alton, Ill.

L. M. JORDAN, formerly with the Studebaker Corporation, South Bend, Ind., has become South Bend sales representative for the Hevi Duty company.

J. B. JACKSON, director of staff, General Motors Corporation, Detroit, has been appointed general manager of the Jackson Steel Products division of the corporation at Jackson, Mich., to succeed C. M. Day, resigned.

R. L. KURTZ has been appointed general purchasing agent of the Buick Motor Co., Detroit, to succeed GEORGE G. ALLEN, to whom he was formerly assistant. Mr. Allen resigned after 14 years service with the company. WILLIAM J. BREWER, formerly assistant purchasing agent, will succeed Mr. Kurtz.

A. J. LYON, 1st Lieutenant, Air Corps, Wright Field, Dayton, Ohio, will present a paper entitled "Aluminum Alloys for Pistons and Air-cooled Cylinder Heads for Aircraft Engines" at the Dayton Aeronautic Meeting of the A.S.M.E., from May 19 to 22.

J. DON ALEXANDER, president, Alexander Industries Corporation, Colorado Springs, Colo., will present a paper en-

titled "Reduction of Airplane Production Costs" at the Dayton Aeronautic Meeting of the A.S.M.E., on May 19.

FRANK K. METZGER, formerly vice-president in charge of sales of the Standard Steel Works, Philadelphia, has been appointed vice-president and general manager, to succeed O. C. SKINNER. R. NEVIN WATT was appointed sales manager and G. H. LEWIS works manager.

H. L. MILLER, formerly chief engineer of the Buda Co., Harvey, Ill., has been appointed manager of electric railway division, Pettibone Mulliken Co., Chicago.

C. E. MOBERG has been appointed works manager for the Beckwith Stove Co., Dowagiac, Mich., and has gone to that city to assume his position, resigning from his post as factory superintendent at the One-Minute Manufacturing Co., Newton, Iowa, with which he had been associated. The Newton factory is undergoing reorganization and his successor will not be named until that is completed.

HAYWARD NEIDRINGHAUS, vice-president and general manager of the Granite City Steel Co., steel division of the National Enameling & Stamping Co., Granite City, Ill., has been elected a director of the Mississippi Valley Trust Co. of St. Louis.

H. T. ROBERTS, resident manager of the Radford, Va., plant of the Lynchburg Foundry Co., Lynchburg, Va., will change places with MAX KUNTANSKY, manager of the Lynchburg works, effective July 1.

FRED L. ROCKELMAN, formerly director of sales for the Ford Motor Co., has become associated with the Chrysler Corporation in an executive capacity. Mr. Rockelman was with the Ford Company for 17 years.

GEORGE F. RUSSELL has been appointed sales manager of the White Co., Cleveland. He will continue as vice-president of the central region, with headquarters at the company's home office.

ALBERT SHAW has been added to the Salt Lake branch office sales force of the Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis.

ALLEN T. SHOENER, assistant works auditor of the Skayef Ball Bearing Co., Hartford, Conn., a subsidiary of the SKF Industries, Inc., New York, has been appointed works auditor of the Hess-Bright Manufacturing Co., Philadelphia, Pa., also an SKF subsidiary.

W. E. TROUTMAN, vice-president and general manager of the Duquesne Steel Foundry Co., Corapolis, Pa., has been nominated president of the Pittsburgh Foundrymen's association for the fiscal year starting June 1. H. F. SEIFERT, Westinghouse Electric & Manufacturing Co., East Pittsburgh, has been nominated for vice-president, and WILLIAM J. BRANT, Pittsburgh, has been nominated to continue as secretary-treasurer. Included in the members nominated for the executive committee of the association are: L. W. MESTA, Mesta Machine Co., Homestead, Pa.; F. C. T. DANIELS, Mackintosh-Hemphill Co., Pittsburgh; W. J. CORBETT, Fort Pitt Steel Casting Co., McKeesport, Pa.; H. P. SPILKER, Sterett-Thomas Foundry Co., Pittsburgh, and T. A. REYNOLDS, McConway-Torley Co., Pittsburgh.

C. W. TYLER and ELLSWORTH H. ROLLINS, Laconia, N. H., have purchased the malleable iron foundry of

the Laconia Car Co. and will organize a company to conduct a foundry business.

R. S. DAMON, airplane manufacturing engineer of the Curtiss-Wright Corporation, New York City, will present a

paper entitled "Production Methods in Airplane Construction" at the Dayton Aeronautic Meeting of the A.S.M.E., from May 19 to 22.

M. V. VALE, formerly of the George E. Corbett Boiler & Tank Co., Chicago, has been appointed general manager of the Atlas Boiler & Welding Co., which opened this week at 50 Dexter Ave., Elgin, Illinois.

WILFRED VAUGHN has been appointed general purchasing agent of the Heintz Manufacturing Co., Philadelphia.

A. E. WALKER, formerly general sales manager of the Republic Iron & Steel Co., New York, has been appointed assistant vice-president of the new Republic Steel Corporation, according to an announcement by H. T. GILBERT, vice-president in charge of sales. J. M. SCHLENDORF, formerly vice-president in charge of sales of the Central Alloy Steel Corporation, will assume the duties of sales manager of alloy steel products. NORMAN FOY, Birmingham district manager of the old Republic organization, becomes sales manager of mild steel products, with headquarters at Youngstown.

ALBERT P. WITHALL, manager of sales for W. H. Miner, Inc., Chicago, was elected president recently to succeed the late William H. Miner.

Obituaries

THOMAS L. ANDREWS, 63, formerly connected with the Marshall Foundry Co., Pittsburgh, vice-president of the Bollinger - Andrews Construction Co., and organizer of the Andrews Engineering Co., died at the Pittsburgh hospital recently.

JAMES ARTHUR, 89, founder and former president of the Arthur Machine Works, Brooklyn, N. Y., died on April 27 at his home in Winsted, Connecticut.

JAMES WILLIAM BEAMAN, for the past 27 years malleable iron foundry superintendent of the William E. Pratt Manufacturing Co., Chicago, died on April 10.

NILS FALK, 50, secretary and treasurer of the Vanadium Corporation of America, New York, died on April 21 while on a business trip in South Rhodesia, South Africa. He was for many years a member of the sales staff of the Carnegie Steel Co., Pittsburgh.

W. H. FREET, 48, assistant sales manager of the Chambersburg (Pa.) Engineering Co., died on April 26. Mr. Freet joined the Chambersburg Engineering Company in 1900, and from 1910 to 1928, he was purchasing agent.

C. E. MCDANIEL, 73, president of the Ottumwa (Ia.) Boiler Works, which he founded several years ago, died on April 22 in his home after several weeks' illness.

ALEXANDER D. MORGAN, Boston dealer in heavy machinery, died suddenly of heart disease on April 25. He was born 65 years ago in Roxbury, Massachusetts.

JOHN L. ROSS, 52, died on April 24 at his home in Roselle Park, N. J. He was a mechanical engineer with offices at 6 Varick St., New York.

FRED C. WILSON, 51, president of the Wilson Manufacturing Co., Rochester, N. Y., and an inventor of note, died recently at his home in that city, following a short illness.

Forthcoming Meetings

AMERICAN IRON & STEEL INSTITUTE —Spring meeting at the Commodore hotel, New York, N. Y. on May 9.

AMERICAN FOUNDRYMEN'S ASSOCIATION — Annual Convention, Cleveland Public Auditorium, Cleveland, Ohio, May 12-17. C. E. Hoyt, 222 W. Adams St., Chicago, is secretary-treasurer.

STEEL FOUNDERS SOCIETY OF AMERICA—May meeting, Hotel Hollenden, Cleveland, Ohio, May 14. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fifth national aeronautic meeting, May 19-21, Dayton, Ohio, and Wright field. Calvin W. Rice, 29 West 39th St., New York, is secretary.

NATIONAL FOREIGN TRADE COUNCIL —Convention at Hotel Biltmore, Los Angeles, May 21-23. O. K. Davis, 1 Hanover Square, New York City, is secretary.

SOCIETY OF AUTOMOTIVE ENGINEERS —1930 Summer Meeting, French Lick Springs Hotel, French Lick Springs, Ind., May 25-29. National headquarters are at the Engineering Societies Bldg., 29 W. 39th St., New York City.

ASSOCIATED MACHINE TOOL DEALERS —Meeting at Granville Inn, Granville, Ohio, June 4 to 5. A. G. Bryant, 2558 West 16th St., Chicago, is secretary.

NATIONAL ASSOCIATION OF FOREMEN —Convention at Toledo, Ohio, June 6-7. Harry J. Baumker, 316 Tenth St., Toledo, is convention secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 9 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

NATIONAL ASSOCIATION OF PURCHASING AGENTS—Fifteenth annual convention, Stevens Hotel, Chicago, June 16-19. "Inform - A - Show" in conjunction. G. A. Renard, 11 Park Place, New York City, is secretary-treasurer.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

WORLD POWER CONFERENCE—Second annual conference, Berlin, Germany, June 16-25. O. C. Merrill, Edmonds Bldg., Washington, is U. S. chairman.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

STEEL FOUNDERS' SOCIETY OF AMERICA—Semi-annual convention, Greenbrier Hotel, White Sulphur Springs, Va., June 26-27. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

INTERNATIONAL CONGRESS FOR GENERAL MECHANICS — Liege, Belgium, Aug. 31 to Sept. 7. For information address Alb. Schlag, 4 Place Saint Lumbert, Liege, Belgium.

NATIONAL METAL CONGRESS—Twelfth annual Congress and Exposition, Stevens Hotel, Chicago, Sept 22-26. W. H. Eisenman, secretary of the A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio, is director.

AMERICAN WELDING SOCIETY—Annual fall meeting, Congress Hotel, Chicago, September 22-26. W. M. Spraragen, 29 W. 39th St., New York, N. Y. is technical secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual fall meeting of Iron & Steel Division and Machine Shop Practice Division, Stevens Hotel, Chicago, September 22-26. P. T. Wetter, 29 W. 39th St., New York, secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of Iron & Steel Division, Stevens Hotel, Chicago, September 22-26. T. T. Read, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of the Institute of Metals Division, Stevens Hotel, Chicago, September 22-26. W. M. Corse, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN SOCIETY FOR STEEL TREATING—Annual Convention, Stevens Hotel, Chicago, September 22-26. W. H. Eischman, 7016 Euclid Ave., Cleveland.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

IN METALS, the competition for available business is growing keener as volume of orders on books continues to diminish. Current inquiries indicate an awakening demand for railway steel after the recent slump. Other steel materials, on the contrary, continue in small demand. Price changes of the week, in the materials covered in the accompanying table, were all downward. Materials affected were: blue-annealed sheets, Pittsburgh; slab zinc, E. St. Louis; solder and babbitt metal, New York.

(All prices as of May 2, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76@ 22.26
Virginia No. 2	24.04
Basic	19.75@ 20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	20.26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.80@1.90	3.35†	3.25	3.50@3.60†
No. 12	1.85@1.95	3.45†	3.30	3.55@3.65†
No. 14	1.95@2.05	3.55†	3.40	3.60@3.70†
No. 16	2.05@2.15	3.65†	3.50	3.70@3.80†
Black				
Nos. 18 to 20	2.45	3.85†	3.55	3.45@3.70
No. 22	2.60	4.00†	3.70	3.60@3.85
No. 24	2.65	4.05†	3.75	3.65@3.90
No. 26	2.75	4.15†	3.85	3.75@4.00
No. 28	2.90	4.75†	4.00	3.90@4.15
Galvanized				
No. 10	2.60	3.90†	3.80	3.55@3.80
Nos. 12 to 14	2.70	4.00†	3.90	3.65@3.90
No. 16	2.80	4.10†	4.00	3.75@4.00
No. 18	2.95	4.25†	4.15	3.90@4.15
No. 20	3.10	4.40†	4.30	4.05@4.30
No. 22	3.15	4.45†	4.35	4.10@4.35
No. 24	3.30	4.60†	4.50	4.25@4.50
No. 26	3.55	4.85†	4.75	4.50@4.75
No. 28	3.80	5.10†	5.00	4.75@5.00

*Light Plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. butt..	56.02%	43.48%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52. 6%	40.06%	53.3%	40.3%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches External	Diameter in Inches Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27½	1.9	1.61	.145
½	.37	2.375	2.067	.154
⅝	.58½	2.875	2.469	.203
¾	.76½	3.5	3.068	.216
⅞	.92	4.0	3.548	.226
1	1.09	4.5	4.026	.237
1¼	1.48	5.563	5.047	.258
1½	1.92	6.625	6.065	.28
2	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness Decimal	B.w.g. and Fractions	Outside Diameter ⅛	¼	⅜	½	1	1⅛	1¼
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	3.75†
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00†
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10†
Soft steel bars	3.25†	3.00	3.00†
Soft steel bar shapes	3.25†	3.00	3.00†
Soft steel bands	3.75†	3.65	3.20†
Tank plates	3.30†	3.00	3.10†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick by ¾-in. wide. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.25
Tin, Straits, pigs, New York			38.00@39.00
Lead, pigs, E. St. Louis	5.40	New York	6.50@ 7.00
Zinc, slabs, E. St. Louis	4.72½	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.25@10.75	11.50	14.50
Copper sheets, base	23.75	22.75	23.75
Copper wire, base	16.00	15.87½	15.87½
Copper, drawn, round, base	22.25	22.25	22.25
Copper tubing, base	26.00	26.00	26.00
Brass sheets, high, base	20.50	20.50	20.50
Brass tubing, high, base	25.50	25.50	25.50
Brass rods, high, base	18.75	18.75	18.75
Brass wire, high, base	21.00	21.00	21.00

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.25@11.00	11.75	10.11
Solder (½ and ½).....	27.25	27.50	26@28
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade.....			54.00
Commercial genuine, intermediate grade.....			40.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt, f.o.b.....			11.00

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	50.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	11.50@11.75	13.50	10.25@10.75
Copper, heavy, and wire..	10.25@10.50	13.00	9.50@10.00
Copper, light, and bottoms	9.00@ 9.25	12.00	8.75@ 9.25
Heavy lead.....	4.25@ 4.50	5.25	3.50@ 4.00
Tea lead.....	2.25@ 2.50	3.25	2.50@ 3.00
Brass, heavy, yellow.....	6.25@ 6.37½	8.00	6.00@ 6.50
Brass, heavy, red.....	9.00@ 9.25	12.50	8.50@ 9.00
Brass, light.....	5.00@ 5.25	7.00	5.00@ 5.50
No. 1 rod-brass turnings.	7.25@ 7.50	8.00	7.00@ 7.50
Zinc.....	2.25@ 2.50	3.00	2.00@ 2.25

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton, waste, white, per lb....	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb....	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.01¾	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.15	.164	.154
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt.....	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.	$0.0325	$0.0325	$0.0325
Cold drawn shafting..	per lb.	.034	.034	.035
Brass rods.....	per lb.	.1875	.2125	.2487½
Solder (½ and ½).....	per lb.	.2725	.285	.3275
Cotton waste, white..	per lb.	.13	.13	.10@.13½
Disks, aluminumoxide mineral, cloth, No. 1 6-in. dia.....	per 100	4.59	4.59	3.60
Lard cutting oil.....	per gal.	.75	.75	.55
Machine oil.....	per gal.	.33	.33	.33
Belting, leather, medium.....	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs....	off list	50–10%*	50–10%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*..	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton....	Connellsville,		2.60
Coke, prompt foundry, per net ton....	Connellsville,		3.50@4.85
White lead, dry.....	100 lb. kegs...	New York,	13.75
White lead, in oil.....	100 lb. kegs...	New York,	14.25
Red lead, dry.....	100 lb. kegs...	New York,	13.75
Red lead, in oil.....	100 lb. kegs...	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws::	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, 7/16-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Bronzing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Calif., San Francisco — L. S. Leavy, City Purch. Agt.—will receive bids until May 12 for small tool equipment for general, woodworking, and sheet metal shops at Park-Presidio junior high school, also machinery for general and woodworking shops at Roosevelt junior high school and equipment for general, woodworking and pattern shops at Balboa high school.

Iowa—Iowa State Highway Commission Ames —will receive bids until May 13 for a light crawler type crane with drag line bucket of ⅛ to ½ yd. capacity.

Mich., Detroit—C. L. Schwartz, 2226 Buhl Bldg.—punch press, electric drill press, hack saw and paint spray.

Mo., St. Louis—Clar-Del Garage, 5635 Delmar Blvd.—automobile repair shop equipment.

O., Dayton — Garrison Machine Works, 28 South St. Clair St., J. R. Garrison, Purch. Agt.—lathe, 24 in., drill press, automatic machine and air compressor.

Ont., Welland—Joseph Stokes Rubber Co., John St., P. O. Gunkel, Mgr. — interested in prices complete equipment for proposed 40 x 60 ft. machine shop and 50 x 60 ft. laboratory.

Opportunities for Future Business

Calif., Emeryville—American Tractor Equipment Co., 5301 Horton St., Oakland, awarded contract for the construction of a 1 story factory here. Estimated cost $40,000.

Calif., Los Angeles—Bd. of Education, is having plans prepared for a high school including 1 story, 70 x 160 ft. shop building, etc. at Griffith Park Blvd. Estimated cost $382,000. G. M. Lindsey and E. P. Eiden, 609 Union Insurance Bldg., Archts.

Calif., San Francisco — Braun-Steeple Co., 1088 Howard St., affiliated with Braun & Co., New York and Chicago, Ill. (manufacturers of ornamental iron products), plans the construction of a factory at Potrero Ave. and 18th St. Estimated cost to exceed $40,000.

Conn., Waterbury—Scoville Mfg. Co., 99 Mill St., manufacturers of brass, bronze, aluminum and steel stampings, brass forgings, etc., is receiving bids for a 3 story, 90 x 300 ft. factory on Ambrose St. Estimated cost $200,000. H. L. Thompson, 59 North Main St., Archt.

Ill., Chicago—G. M. Davis Regulator Co., 422 Milwaukee Ave., has work under way on a 1 story factory for the manufacture of steam, oil and gas pressure regulators, reducing valves, etc. at 2541 South Washtenaw Ave. Estimated cost $55,000.

Ill., Chicago — Grigsby-Grunow Co., 6103 Dickens Ave. (radios), awarded contract for a 1 story, 155 x 240 ft. factory for the manufacture of the new "Majestic" electric refrigerator. Estimated cost $50,000.

Ill., East St. Louis—Philip Carey Co., Lockland, Cincinnati, O., is having preliminary plans prepared for the construction of a plant for the manufacture of aluminite insulating material here. Estimated cost $500,000. T. A. Griffiths, c/o owner, Engr.

Ill., Quincy—Bd. of Education, W. W. White, Secy., Musselman Bldg., is having plans prepared for the construction of a 4 story high school, including machine shop, etc., at 14th, Maine and Jersey Sts. Estimated cost $1,350,000. J. D. Chubb, 109 North Dearborn St., Chicago, and Behrensmeyer & Haffner, Western Catholic Union Bldg., Assoc. Archts.

Ind., Fort Wayne — H. Sudbrink, awarded contract for the construction of a machine shop and service station. Estimated cost $40,000.

Ind., Terre Haute—American Can Co., is having plans prepared for the construction of a factory. Estimated cost $1,000,000. Private plans.

Ia., Sioux City—Benson Furniture Co., 1911 East 4th St., awarded contract for a 5 story, 50 x 110 ft. furniture factory. Estimated cost $80,000. Noted Apr. 17.

La., Baton Rouge—City will soon award contract for the construction of an administration building, auditorium building, boys shop, etc., for Louisiana State School for the Blind. Favrot & Livaudais, Ltd., 1208 Hibernia Bank Bldg., New Orleans, Archts.

Md., Baltimore—H. F. Doeleman, Baltimore Trust Bldg., Engr., will receive bids until May 12 for a 2 and 3 story, 112 x 200 ft. factory, etc. at Elm Ave. and 32nd St. for J. H. Ferguson, 1918 Harford Ave. Estimated cost $200,000. F. Thomas, 726 East 33rd St., Archt. Noted Apr. 10.

Mass., Attleboro — L. G. Balfour Co., 25 County St., will build a 1 and 3 story addition to jewelry factory. Estimated cost $50,000. O. M. Higgins, Park St., Archt. Work will be done by separate contracts. Noted Feb. 27.

Mass., Cambridge (Boston P. O.) — F. W. Webster, 340 Congress St., Boston, manufacturers of typewriter supplies, is receiving bids for a 5 story factory and office at Wadsworth and Hayward Sts. Estimated cost $40,000. Densmore, LeClear & Robbins, Park Sq. Bldg., Boston, Archts. Noted Mar. 20.

Mass., Springfield—Chapman Valve Co., Pine St., Indian Orchard, is having plans prepared for the construction of a 1 story addition to plant. Estimated cost $50,000. McClintock & Craig, 458 Bridge St., Archts.

Mich., Detroit—National Steel Corp., 1319-23 Kingsbury St., Chicago, Ill., awarded contract for the construction of a merchant bar mill here. Estimated cost $1,500,000.

N. J., Hawthorne (br. Paterson)—J. C. Van Vlandren, 140 Market St., Paterson, Archt., will receive bids about May 15 for a 2 story, 90 x 140 ft. garage at Nelson and Pasadena Ave., here, for S. Braen, 115 Totawa Ave., Paterson. Estimated cost $150,000. Noted May 1.

N. J., Irvington—Helwig Welding Co., 1374 Springfield Ave., awarded contract for the construction of a 1 story, 50 x 100 ft. welding plant at 42-44 Cordier St. Estimated cost $40,000.

N. J., Jersey City—J. Dixon Crucible Co., Monmouth St., awarded contract for a 4 story, 50 x 100 ft. addition to laboratory at 344 Monmouth St. Estimated cost $100,000.

N. J., Montclair—Lewis & Leonard, 51 East 42nd St., New York, N. Y., Archts., will receive bids about June 1 for the construction of a 2 story garage, etc., on Grove St. for White Motors Sales Inc., 640 Bloomfield Ave., Montclair. Estimated cost $150,000. Noted Apr. 17.

N. J., North Bergen—Township Commission, Municipal Bldg., will receive bids about June 1 for a 3 story, 90 x 100 ft. garage, signal station, etc. Estimated cost $150,000. R. B. Glenn, Municipal Bldg., Archt. and Engr.

N. J., Passaic—Owner, c/o F. P. Friedman, 395 Springfield Ave., Newark, Archt., will not construct 1 story, 140 x 150 ft. garage and service shop here. $150,000. Project abandoned. Noted Oct. 31.

N. J., Paterson—Silk City Electric Supply Co., 43 Broadway, awarded contract for a 1 story, 50 x 150 ft. garage, warehouse, etc., at Van Houten St. Estimated cost $150,000.

N. Y., Endicott—International Business Machine Corp., will receive bids until May 14 for remodeling present buildings. C. H. Higgins, 101 Park Ave., New York, Archt.

N. Y., Jamaica—Kramhold Realty Co., 85-29 169 Jamaica Ave., will build an automobile laundry, service station, etc., at Rocky Hill Rd. and 91st Ave. Estimated cost $40,000. D. J. Levinson, 163-18 Jamaica Ave. Work will be done by day labor and separate contracts.

N. Y., Long Island City—Rhodes & Schamfeld, 31-88 33rd St., will award contract about Nov. 1 for the construction of a garage, service station, etc., at Broadway and 23rd St. Estimated cost $40,000. C. Marsac, 31-06 30th Ave., Astoria, Archt. Noted Apr. 24.

N. Y., Long Island City—Ritter Swenson Corp., 41-27 29th St., is having sketches made for the construction of a 200 x 200 ft. garage at Rawson St. and Queens Blvd. Estimated cost $110,000. A. Eccles, 2928 Hunterspoint Ave., Archt.

N. Y., New York—Consolidated Gas Co. of New York, 4 Irving Pl., plans the construction of a 3 story, 99 x 100 ft. repair shop at 71st and Exterior Sts. Estimated cost $350,000. J. F. Hunter, 4 Irving Pl., Archt.

N. Y., New York—Corp., c/o F. Fischbach, 226 East 41st St., is having sketches made for a 100 x 125 ft., garage at 406 East 91st St. Estimated cost $150,000. H. Ginsberg, 205 East 42nd St., Archt.

N. Y., New York—Gerosa Paladino Holding Corp., 286 East 137th St., will receive bids about Aug. 1 for the construction of a 100 x 320 ft. garage, service station, etc., at Webster Ave. and 182nd St. Estimated cost $75,000. De Rose & Cavalieri, 370 East 149th St., Archts. Noted Apr. 24.

N. Y., Richmond Hill—Metz Auto Sales & Laundry Co., 127-15 Metropolitan Ave., is having sketches made for a 76 x 112 ft. garage at Metropolitan Ave. and 129th St. Estimated cost $50,000. W. Holliday, c/o owner, Archt.

O., Cleveland—Brown-Graver Co., D. G. Spalding, Secy., 804 East 55th St., awarded contract for the construction of all story lumber mill and office on Miles Ave. Estimated cost $40,000.

O., Cleveland—Oregon-Twenty First Co., c/o M. O'Neil, East 21st St. and Oregon Ave., awarded contract for the construction of a 1 story, 70 x 100 ft. repair shop, 40 x 50 ft. loading platform, etc., at East 21st and Rockwell Ave. Estimated cost $75,000. Noted Mar. 20.

O., Mariemont—Cincinnati Store Fixture Mfg. Co., 109 West Pearl St., plans the construction of a 1 story, 150 x 400 ft. factory on Wooster St. Estimated cost $250,000. S. E. Ponticos, 109 West Pearl St., Cincinnati, Archt.

Pa., Butler—Standard Oil Co. of Pennsylvania, E. Black, in charge Peoples Gas Bldg., Pittsburgh, will soon award contract for the construction of a bulk station including repair shop, warehouse and garage, etc. on Ziegler Ave. here. Private plans.

Pa., East Pittsburgh—Westinghouse Electric & Mfg. Co., will build a 1 story, 100 x 574 ft. manufacturing building. Private plans. Work will be done by separate contracts.

Pa., Pittsburgh—Reliance Steel Castings Co., 28th and Smallman St., is having revised plans prepared for the construction of a foundry and office. Estimated cost $50,000. Lake & Davidson, Negley Bldg., Archt. Former bids rejected. Noted Apr. 3.

Pa., Ridgway—Elliott Co., G. F. Elliott, Mgr., is having plans prepared for the construction of a 2 story, 140 x 160 ft. plant for the manufacture of dynamos, steam turbines, etc. Private plans. Work will be done by owners forces.

Pa., Ridgway—Viking Metal Products Co., awarded contract for a 1 story, 120 x 280 ft. factory. Estimated cost $40,000. Noted Apr. 10.

R. I., Providence—What Cheer Garage Co., Benefit St., is receiving bids for addition and alterations to garage at Benefit and Meeting Sts. Estimated cost $40,000. L. S. Joslin, 339 Newbury St., Boston, Archt.

R. I., Woonsocket—Firestone Tire & Rubber Co., 141 Brookline Ave., Boston, awarded contract for the construction of a 1 story service station here. Estimated cost including equipment $40,000. Noted Apr. 24.

Tex., Lubbock—City is having plans prepared for the construction of an airport including repair shops, etc. Peters, Strange & Bradshaw, Lubbock, Engrs.

Tex., San Benito—Phelps & Dewees, Gunter Bldg., San Antonio, Archts., will receive bids until May 12 for a 1 story, 96 x 242 ft. cafeteria, shops, etc. here for F. N. Booth, San Benito.

W. Va., Morgantown—West Virginia University, State Bd. of Control, Charleston, will receive bids until June 10 for the construction of a 3 story high school including shops, etc. here. Estimated cost $300,000. Private plans.

Wis., Milwaukee—Crane Co., 836 South Michigan Blvd., Chicago, Ill., plans the construction of a 1 story, 100 x 200 ft. warehouse on Capitol Ave. here. Estimated cost $150,000.

Wis., Milwaukee—The Heil Co., 26th and Montana Aves., plans a 2 story, 200 x 200 ft. addition to factory on 26th St.

Wis., Milwaukee—A. O. Smith Corp., 27th and Keefe Sts., manufacturers of pressed steel, is receiving bids for the construction of an 8 story, 140 x 160 ft. administration building and research laboratory on 27th St. Holabird & Root, 333 North Michigan Ave., Chicago, Ill., Archts.

Ont., Hamilton—B. H. and F. Prack, Pigott Bldg., Archts., are receiving bids for a 4 story addition to wire and screen plant for B. Greening Wire Co. Ltd., Queen St. N. Estimated cost $150,000. Noted May 1.

Ont., Toronto—J. & J. Taylor Ltd., 133 Front St. E., plans the construction of a 1 story machine shop in connection with vault and safe plant. Estimated cost $50,000. Harkness & Hertzberg, Confederation Life Bldg., Archts.